THE NATIONAL UNIVERSITY OF ADVANCED LEGAL STUDIES

Kalamassery, Kochi - 683 503, Kerala, India

DISSERTATION

Submitted in partial fulfillment of the requirement for the award of the degree of

MASTER OF LAW (LL.M.)
(2023-2024)

ON THE TOPIC:

CARBON EMISSION TRADING – A CRITICAL ANALYSIS

Under the Guidance and Supervision of

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CERTIFICATE

This is to certify that Anshika Paul, Reg No: LM0223005, has submitted her Dissertation titled "Carbon Emission Trading – A Critical Analysis" in partial fulfillment of the requirement for the award of Degree of Master of Laws in International Trade Law to the National University of Advanced Legal Studies, Kochi under my guidance and supervision. It is also affirmed that the dissertation she submitted is original, bona fide, and genuine.

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DECLARATION

I hereby declare that this dissertation titled "CARBON EMISSION TRADING – A CRITICAL ANALYSIS" has been researched and submitted by me to the National University of Advanced Legal Studies, Kochi, in partial fulfillment of the requirement for the award of Degree of Master of Laws in International Trade Law, under the guidance and supervision of Associate Professor Dr Anil R. Nair, is an original, bona fide, legitimate work. It has been pursued for academic interest. This work or any type thereof has not been submitted by me or anyone else for the award of another degree from either this University or any other University. I also confirm that all the material I borrowed from different sources and incorporated into this dissertation is duly acknowledged. If any material is not duly acknowledged and found incorporated in this thesis, it is entirely my responsibility. I am fully aware of the implications of any such act which might have been committed by me advertently or inadvertently.

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ACKNOWLEDGEMENT

Throughout the journey of completing this dissertation, I have been blessed with the support and encouragement of many remarkable individuals. This work stands as a testament to their unwavering dedication and contributions, for which I am deeply grateful.

First and foremost, my heartfelt gratitude goes to my guide, Dr. Anil R. Nair. His wisdom, guidance, and steadfast support have been the cornerstone of this dissertation. His expertise and insightful feedback have illuminated my path, making this journey a beautiful one.

I would also like to express my profound gratitude to Dr. Mini S. Her encouragement has been pivotal in the completion of this dissertation.

Furthermore, I extend my sincere appreciation to the library and technical staff for their time and effort. Finally, my friends and family. Their boundless love, patience, and unwavering belief in me have been my foundation.

ABBREVIATIONS

Abbreviations Used	Full Form
1. AAU	Assigned Amount Unit
2. AUD	Australian Dollar
3. BEE	Bureau of Energy Efficiency
4. BS VI	Bharat Stage VI
5. CDM	Clean Development Mechanism
6. CDM-EB	Clean Development Mechanism Executive Board
7. CCS	Carbon Capture and Storage
8. CC	Carbon Credit
9. CCTS	Carbon Credit Trading Scheme
10. CCX	Chicago Climate Exchange
11. CET	Carbon Emission Trading
12. CO2	Carbon Dioxide
13. CPCB	Central Pollution Control Board
14. CERC	Central Electricity Regulatory Commission
15. CER	Certified Emission Reduction
16. CEM	Continuous Emission Monitoring
17. COP	Conference of the Parties
18. CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
19. DC	Designated Consumer
20. DESA	Department of Economic and Social Affairs (United Nations)
21. EPA	Environmental Protection Agency
22. ECA	Energy Conservation Act
23. ESG	Environmental, Social, and Governance
24. ESCerts	Energy Saving Certificates
25. EU	European Union
26. EU ETS	European Union Emissions Trading System
27. ETS	Emissions Trading System
28. GBP	Great British Pound
29. GHG	Greenhouse Gas
30. G20	Group of Twenty
31. GDP	Gross Domestic Product
32. Gt	Gigatonne (1,000,000,000 tonnes)
33. ICAO	International Civil Aviation Organization
34. ICM	Indian Carbon Market

35. IEX	Indian Energy Exchange
36. ICAP	International Carbon Action Partnership
37. IET	International Emission Trading
38. IFMR	Institute of Financial Management and Research
39. IPCC	Intergovernmental Panel on Climate Change
40. IMO	International Maritime Organization
41. JI	Joint Implementation
42. J-PAL	Abdul Latif Jameel Poverty Action Lab
43. Kt	Kilotonne (1,000 tonnes)
44. MSR	Market Stability Reserve
45. MCX	Multi Commodity Exchange
46. MoEF	Ministry of Environment and Forests
47. NAAQS	National Ambient Air Quality Standards
48. NAPCC	National Action Plan on Climate Change
49. NCDMA	National CDM Authority
50. NMEEE	National Mission for Enhanced Energy Efficiency
51. NDC	Nationally Determined Contributions
52. NYMEX	New York Mercantile Exchange
53. PAT	Perform, Achieve and Trade
54. PEMS	Predictive Emission Monitoring Systems
55. PXIL	Power Exchange India Limited
56. RGGI	Regional Greenhouse Gas Initiative
57. RMU	Removal Unit
58. SEC	Specific Energy Consumption
59. SPCB	State Pollution Control Boards
60. UNFCC	United Nations Framework Convention on Climate Change
61. USD	United States Dollar

LIST OF STATUTES

Air (Prevention and Control of Pollution) Act, 1981

Arbitration and Conciliation Act 1996 (India)

California Global Warming Solutions Act of 2006

Central Electricity Regulatory Commission (CERC) Act 1998 (India)

Clean Air Act (US)

Energy Conservation Amendment Act 2022

National Green Tribunal (NGT) Act 2010 (India)

INTERNATIONAL INSTRUMENTS

Anti-Dumping Agreement (WTO)

Assigned Amount Units (AAUs) (Kyoto Protocol)

Bilateral Investment Treaties (BITs)

California's cap-and-trade program (AB-32)

Clean Development Mechanism (CDM) (Kyoto Protocol)

Emission Rights Purchase Agreements (ERPA).

EU Emissions Trading System (EU ETS)

General Agreement on Tariffs and Trade (GATT)

General Agreement on Trade in Services (GATS)

International Carbon Action Partnership (ICAP)

International Chamber of Commerce (ICC)

Investor-State Dispute Settlement (ISDS) mechanisms

Joint Implementation (JI) (Kyoto Protocol)

Kyoto Protocol

Marrakesh Accord

North American Free Trade Agreement (NAFTA)

Paris Agreement

Permanent Court of Arbitration (PCA)

Regional Greenhouse Gas Initiative (RGGI)

Technical Barriers to Trade (TBT) Agreement (WTO)

United Nations Commission on International Trade Law (UNCITRAL)

United Nations Framework Convention on Climate Change (UNFCCC)

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LIST OF CASES

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CHAPTER 1:
INTRODUCTION

"Men argue. Nature acts."
- Voltaire

This theme, which has been voiced for centuries and will continue to be voiced for many years to come, remains crucial. As humanity begins to comprehend, reflect, and act, let us hope it is not too late.

"Climate change is the defining issue of our time, and we are at a pivotal moment. The actions we take today will have profound implications for the future of our planet and the well-being of all its inhabitants. Climate protection is not merely an environmental issue—it is an urgent and moral imperative that affects every aspect of our lives, from global health and food security to economic stability and social justice. The need for robust and comprehensive climate action has never been more pressing. We must harness the power of innovation, policy, and collective will to reduce greenhouse gas emissions, transition to renewable energy sources, and build resilient communities. Protecting our climate is essential not only for preserving the natural world but also for safeguarding the future of humanity. The time to act is now. We owe it to ourselves, and to future generations, to rise to this challenge with the urgency and determination it demands."

- Ban Ki-moon,
Former Secretary-General of the United Nations

As little as we realize, we are confronted with a stark reality. May 2024 has been recorded as the hottest May in history, marking a year of unprecedented temperatures. This searing trend is more than just a statistic; it is a clarion call, a harbinger of a planet in peril. We stand at a monumental crossroads, a pivotal juncture where the fate of our world teeters on the edge of a precipice. Our actions, reminiscent of the cosmic catastrophe that once heralded the end of the dinosaurs, are wreaking untold havoc on the delicate balance of Earth's climate. Yet, unlike the hapless dinosaurs who succumbed to the merciless strike of a celestial body, we wield the power to alter our trajectory. We are the architects of our destiny, capable of rewriting the narrative, averting disaster, and steering towards a future where harmony with our environment is not just an aspiration, but reality. The heat of May 2024 is more than just an extraordinary event; it is the planet's fevered plea for intervention, a visceral reminder that we can no longer afford the luxury of complacency. This escalating inferno is a testament to the urgency of our predicament, a vivid illustration of the destructive impact we have wrought upon our world.

We are the storm, but we are also the calm that can follow. We are not mere passengers on this journey; we are the navigators. The choices we make today will reverberate through the eons, shaping the legacy we leave for future generations. Let us not be the meteor that extinguishes life, but rather the catalyst for a renaissance of ecological stewardship. The urgency of the situation cannot be overstated. Nearly a decade after the adoption of the Paris Agreement, the goal of limiting global warming to 1.5 degrees Celsius remains tenuous.[1] Recent data reveals that the remaining carbon budget to achieve this target is approximately 200 billion tonnes of carbon dioxide. With current emissions at around 40 billion tonnes annually, this budget will be exhausted well before 2030. To preserve the 1.5-degree threshold, global emissions must decline by nine percent each year until 2030, yet they increased by one percent last year. The implications of surpassing the 1.5-degree limit are dire. The World Meteorological Organization reports an eighty percent chance that global temperatures will exceed this threshold in at least one of the next five years.[2] Such a breach could trigger catastrophic events, including the collapse of the Greenland and West Antarctic ice sheets, resulting in devastating sea-level rise; the destruction of tropical coral reefs, threatening the livelihoods of 300 million people; the disruption of the Labrador Sea Current, which would alter weather patterns in Europe; and the widespread melting of permafrost, releasing vast quantities of methane, a potent greenhouse gas.

The disparity in the impacts of climate change is a grave and harrowing reality. Those least culpable—the impoverished, the vulnerable nations, Indigenous Peoples, women, and girls—find themselves bearing the brunt of an unfolding catastrophe they did little to create. This inequity is a profound injustice, casting a stark light on the ethical dimensions of our environmental crisis. In recent memory, a record-shattering heatwave has swept across Asia, transforming cities into cauldrons of sweltering heat. In southern Africa, droughts have withered crops and drained lifelines, leaving communities parched and desolate. Across East Africa and Brazil, unprecedented floods have surged with fury, submerging homes, eroding landscapes, and dismantling economies. These extreme weather events are not mere anomalies; they are the visceral manifestations of a climate unraveling at the seams.[3] Studies reveal a sobering truth: even if we were to halt all emissions today, the relentless march of climate-related damages would continue unabated, reaching an astronomical $38 trillion annually by 2050. This figure is more than just a number; it is the embodiment of shattered lives, ruined livelihoods, and broken dreams. In the face of such adversity, the resilience of the affected communities is both heart-wrenching and awe-inspiring. These are the frontlines of climate change, where the abstract becomes tangible and the distant future becomes an urgent present. The poorest and most vulnerable are not just statistics in a report; they are our fellow humans, enduring the tempest that the industrialized world has largely wrought.

[1] Hale, T., 2024. Long Problems: Climate Change and the Challenge of Governing Across Time. Princeton University Press.
[2] Bork, K., Bradshaw, K., Carlarne, C.P., Craig, R.K., Fox, S., Galperin, J., Hirokawa, K., Hsu, S.L., Kuh, K., Lynch, K. and Okoh, M., 2022. Adapting to 4 Degrees C World. Env't L. Rep., 52.
[3] Wald, J., 2022. Eco-Horror: Facing Climate Change in Minas Gerais, Brazil. McGill University (Canada).

It demands that we not only acknowledge the disproportionate burden borne by the least responsible but also act with compassion and resolve to redress this balance. As the storms rage and the waters rise, we must stand in solidarity. The future of our planet hinges not just on the mitigation of climate change, but on the moral imperative to protect those most imperiled by its relentless advance.

Despite the bleak outlook, we possess the tools and knowledge to combat this crisis. Natural carbon sinks, such as forests, wetlands, and oceans, play a crucial role in absorbing atmospheric carbon. Concurrently, renewable energy sources are becoming increasingly viable and cost-effective. Onshore wind and solar power are now the cheapest sources of new electricity in most regions, and investments in clean energy have reached unprecedented levels, with renewables accounting for thirty percent of global electricity supply.[4] To avert the worst impacts of climate change, urgent and coordinated action is required. The largest emitters, particularly the G20 countries, must lead by example, reducing emissions and supporting developing nations in their transition to sustainable energy. Nationally determined contributions (NDCs) must reflect ambitious targets for 2030 and 2035, encompassing all sectors and greenhouse gasses.[5] These plans should align with the global transition to net-zero emissions by 2050, phasing out fossil fuels and achieving key milestones along the way. Additionally, adaptation measures must be scaled up to protect vulnerable communities from the inevitable impacts of climate change. This includes ensuring that every individual on Earth is covered by an early warning system by 2027 and increasing adaptation finance to at least $40 billion annually by 2025. The international financial architecture must also be reformed to facilitate the flow of affordable finance to developing countries, enabling them to invest in clean energy and resilience-building measures.

A critical aspect of this transformation involves confronting the fossil fuel industry. Despite their substantial profits, fossil fuel companies have invested minimally in clean energy, instead prioritizing activities that exacerbate climate change. Financial institutions must cease funding fossil fuel projects and redirect investments towards renewable energy. Moreover, governments should implement measures to dissuade fossil fuel advertising and impose effective carbon pricing to fund climate action. The role of civil society is paramount in this endeavor. Individuals, cities, regions, and businesses must champion the transition to a sustainable future. Collective action and public pressure can drive systemic change, ensuring that the voices of the majority prevail over the interests of polluters. The fight against climate change is a defining challenge of our time, one that requires unprecedented cooperation and ambition. As we navigate this moment of truth, we must embrace the opportunity to secure a safe, sustainable future for all. The decisions made today will determine the fate of generations to come. The time to act is now. Amidst these grave

[4] Mann, M.E., 2023. *Our Fragile Moment: How Lessons from Earth's Past Can Help Us Survive the Climate Crisis*. Hachette UK.

[5] Benveniste, H., Boucher, O., Guivarch, C., Le Treut, H. and Criqui, P., 2018. Impacts of nationally determined contributions on 2030 global greenhouse gas emissions: uncertainty analysis and distribution of emissions. Environmental Research Letters, 13(1), p.014022.

challenges, emissions trading emerges as a vital mechanism to curb greenhouse gas emissions.[6] This market-based approach, particularly carbon trading, transforms emissions into a new commodity, thus integrating environmental costs into the economic system. Parties to the Kyoto Protocol, especially those with commitments under Annex B, have accepted targets for limiting or reducing emissions, expressed as levels of allowed emissions divided into Assigned Amount Units (AAUs). Emissions trading, as outlined in Article 17 of the Kyoto Protocol, enables countries with surplus emission units to sell this excess capacity to nations exceeding their targets, thereby creating a "carbon market" where carbon dioxide is traded like any other commodity.

In addition to AAUs, other tradable units include Removal Units (RMUs) from land use, land-use change, and forestry activities; Emission Reduction Units (ERUs) from joint implementation projects; and Certified Emission Reductions (CERs) from Clean Development Mechanism projects. These transactions are meticulously tracked through registry systems under the Kyoto Protocol, ensuring secure transfers via an international transaction log. This comprehensive framework not only facilitates the trading of emission units but also enhances transparency and accountability, reinforcing the integrity of the global carbon market.[7] To safeguard against the overselling of units, each Party must maintain a "commitment period reserve" of ERUs, CERs, AAUs, and RMUs in its national registry. This reserve must not fall below 90% of the Party's assigned amount or 100% of five times its most recently reviewed inventory, whichever is lower, ensuring that countries remain capable of meeting their own emissions targets. Emissions trading schemes also play a crucial role at national and regional levels. The European Union Emissions Trading Scheme (EU ETS), the largest of its kind, sets emissions obligations for participating entities, driving reductions through market incentives. Such schemes are integral to climate policies, fostering cooperation and ensuring that emission reductions are achieved in the most cost-effective manner. In the annals of environmental policy, the establishment of the European Union Emissions Trading System (EU ETS) in 2005 marks a seminal moment, representing the dawn of a robust mechanism designed to curb greenhouse gas emissions through a cap-and-trade system.[8] The EU ETS emerged not in isolation but as a grand evolution of earlier, more modest experiments in emissions trading. Notably, it drew inspiration from the United States' sulfur dioxide trading program, an initiative that had already proven its efficacy under the Acid Rain Program in the 1990s.[9] In essence, the EU ETS sets a cap on the total volume of greenhouse gasses that can be emitted by all participating entities, distributing emission allowances which can be bought, sold, or traded as companies navigate their paths to compliance. This market-based approach introduces

[6] Limmeechokchai, B., Rajbhandari, S., Pradhan, B.B., Chunark, P., Chaichaloempreecha, A., Fujimori, S., Oshiro, K. and Ochi, Y., 2023. Scaling up climate ambition post-2030: a long-term GHG mitigation analysis for Thailand. Climate Policy, 23(2), pp.168-183.
[7] Osuji, N., Blockchain Technology For Monitoring And Reporting Of Carbon Emission Trading.
[8] Kruger, J., Oates, W.E. and Pizer, W.A., 2007. Decentralization in the EU emissions trading scheme and lessons for global policy.
[9] UNFCCC. (n.d.). Reforms to the EU ETS. Retrieved from https://unfccc.int (23 November 2023)

flexibility and economic incentives, encouraging companies to innovate and reduce emissions at minimal costs.

As the poet and environmental advocate Wendell Berry once reflected, *"The Earth is what we all have in common."* The EU ETS embodies this sentiment, fostering a collaborative effort across borders to protect our shared environment. Through this pioneering policy, the European Union has set a precedent for global climate action, proving that collective effort and market mechanisms can indeed harmonize economic activity with the imperative of environmental stewardship. The global landscape of climate policy is witnessing a transformative shift, marked by the European Union's pioneering initiatives and China's emerging prominence in the sphere of carbon markets. Both entities, each with their own historical, economic, and political contexts, have laid down ambitious pathways to address the existential threat of climate change.[10] As the climate crisis intensifies, these efforts represent not just regional but global milestones in the collective endeavor to secure a sustainable future. The European Union, with its storied history of environmental leadership, has unfurled a vision of climate neutrality by 2050. This vision is not a mere declaration but a meticulously crafted strategy, underscored by a commitment to reduce greenhouse gas emissions by at least 55% by 2030, relative to 1990 levels.[11] Central to this vision is the "Fit for 55" package, a comprehensive suite of legislative proposals designed to align various sectors with the overarching climate goals. As noted by the United Nations Framework Convention on Climate Change (UNFCCC), the EU's Emissions Trading System (ETS) stands as a cornerstone of this package, undergoing reforms to enhance its efficacy and expand its scope.[12]

"*To meet our climate targets, we need to make the European Green Deal our new growth strategy*," stated Ursula von der Leyen, President of the European Commission. This sentiment encapsulates the EU's approach, which seeks to harmonize economic growth with environmental stewardship. The Fit for 55 package encompasses reforms across energy, transport, and industry, aiming to catalyze a green transformation across the continent. It signifies a paradigm shift, where economic prosperity is no longer decoupled from environmental sustainability but is intrinsically linked to it. Guy McPherson says, "*If you really think that the environment is less important than the economy, try holding your breath while you count your money*." Parallelly, China has embarked on a monumental journey of its own, marked by the inauguration of its national carbon market in 2021. Initially encompassing the power sector, this market is poised for expansion, envisaging a future where multiple sectors are brought under its ambit. With this initiative, China seeks to attain peak carbon emissions by 2030 and achieve carbon neutrality by 2060—a timeline that reflects both ambition and the pragmatic realities of its development trajectory.[13] As articulated by the

[10] Gallagher, K.S., 2014. The globalization of clean energy technology: Lessons from China. MIT press.
[11] UNFCCC. (n.d.). The EU's "Fit for 55" package: Towards climate neutrality by 2050. Retrieved from https://unfccc.int last accessed 23 November 2023
[12] https://unfccc.int/process/the-kyoto-protocol/mechanisms/emissions-trading last accessed 23 November 2023
[13] Harvard Environmental Economics Program. (n.d.). California's Cap-and-Trade Program: An Overview. Retrieved from https://scholar.harvard.edu (2023, November 14)

Harvard Environmental Economics Program, China's carbon market is unparalleled in scale, covering a volume of emissions that surpasses any existing system globally. This scale brings with it both challenges and opportunities, necessitating robust regulatory frameworks and mechanisms to ensure transparency and efficacy. “China's carbon market is a critical step towards aligning its economic growth with global climate goals,” observed Robert Stavins, a noted environmental economist. Indeed, China's commitment to carbon neutrality signifies a pivotal shift in the global climate discourse, underscoring the role of major developing economies in the fight against climate change.

The global narrative of climate action is a tapestry woven with the threads of pioneering carbon emission trading systems,[14] with the European Union's Emissions Trading System (EU ETS) and California's cap-and-trade program standing as luminous examples. These mechanisms, through their meticulous design and steadfast implementation, have unfurled a banner of hope, demonstrating the power of market-based strategies in driving profound reductions in greenhouse gas emissions and nurturing the growth of clean technologies. The EU ETS, the world's inaugural major carbon market, has been heralded for its substantial contributions to emission reductions in the realms it governs, particularly in power generation and industry. According to the U.S. Environmental Protection Agency (EPA), the EU ETS has crafted a robust framework for trading emission allowances, igniting a spark of innovation and compelling industries to shrink their carbon footprints.[15] Over the years, this system has evolved with an ever-tightening cap, catalyzing continuous improvements in emission reductions and fostering investments in renewable energy and energy efficiency. Across the ocean, California's cap-and-trade program, born from the landmark legislation AB-32, mirrors the EU ETS's success in a distinct yet equally compelling context.[16] Encompassing major sources of greenhouse gasses, this program has been pivotal in enabling California to surpass its 2020 emission reduction goals ahead of schedule. Its design, featuring a steadily declining cap on emissions and a comprehensive allowance trading mechanism, has effectively propelled emission reductions across diverse sectors. California's cap-and-trade program epitomizes a holistic approach to climate action, supporting a rich mosaic of climate initiatives and investments in renewable energy and energy efficiency.[17] By channeling revenues from allowance auctions into climate resilience projects and disadvantaged communities, the program elegantly addresses social equity concerns, demonstrating that environmental and social goals can be pursued in unison.

As we journey deeper into the intricacies of carbon emission trading in the forthcoming chapters, our exploration will unfold into a multifaceted examination of these systems. We will delve into their viability, unravel the frameworks and policy implications that anchor their success, and illuminate potential loopholes that may shadow their efficacy. Our analysis will be guided by an

[14] What Is Emissions Trading? | US EPA. (2023, November 14). US EPA. https://www.epa.gov/emissions-trading-resources/what-emissions-trading last accessed 24 November 2023

[15] Gupta, S., 2021. Oil Industry's Pro-Climate Agenda: Fifty Shades of Green. Wash. U. Global Stud. L. Rev., 20.

[16] California Air Resources Board (CARB). (n.d.). AB-32: Global Warming Solutions Act. Retrieved from https://ww2.arb.ca.gov last accessed 24 November 2023

[17] Vision, S.S., 2013. CLIMATE ACTION PLAN.

unwavering commitment to understanding how these mechanisms can be optimized to yield the most harmonious outcomes for both the climate and society. In our quest for comprehensive understanding, we will uncover the critical elements that contribute to the effectiveness of carbon markets, including the artful design of cap-and-trade systems, the vigilant role of regulatory oversight, and the vibrant interplay of market dynamics. We will also explore the broader policy landscape, assessing how complementary measures such as renewable energy mandates and energy efficiency standards synergize with carbon trading mechanisms. By embarking on this rigorous analysis, we aspire to provide a nuanced perspective on carbon emission trading, offering insights that can enlighten policymakers, stakeholders, and researchers in their endeavors to refine these systems. Ultimately, our goal is to enrich the global discourse on climate action, presenting evidence-based recommendations that can help guide the world towards a more sustainable and resilient future.

"*We are at a critical juncture in our fight against climate change. The choices we make in the next few years will determine the fate of our planet for centuries to come. Mechanisms like the EU Emissions Trading System and California's cap-and-trade program, offer a powerful tool to drive the transformation we need. These systems not only incentivize reductions in greenhouse gas emissions but also catalyze innovation in clean technologies and renewable energy. They exemplify how market-based solutions can align economic growth with environmental sustainability. However, it is essential that these systems are continually refined to address emerging challenges and to ensure fairness and transparency. The journey towards a carbon-neutral future is fraught with obstacles, but with collective effort and unwavering commitment, we can create a sustainable and resilient world for future generations. The time to act is now, and we must rise to this monumental challenge with courage and conviction*."

- *Christiana Figueres,*
(Former Executive Secretary of the UN Framework Convention on Climate Change)

OBJECTIVES

- To identify and critically analyze various international and regional agreements that incorporate carbon emission trading mechanisms.

- To examine India's compliance with international agreements featuring carbon emission trading mechanisms, with a particular emphasis on the legal obligations and enforcement measures.

- To conduct a comprehensive analysis of the legislative and regulatory framework governing carbon emission trading in India.

- To address and evaluate the deficiencies of the draft document prepared under the Energy Conservation Amendment Act 2022.

- To assess the impact of carbon emission trading on international trade, specifically examining whether such regulations constitute trade barriers or provide incentives to developing industries.

STATEMENT OF PROBLEM

Given the comprehensive analysis of Carbon Emission Trading (CET) and an examination of the intricacies of its framework, alongside an assessment of policy implications, is the CET mechanism and proposed framework efficient and adequate for addressing environmental concerns related to carbon emissions, without unduly inhibiting industrial growth or trade.

RESEARCH QUESTIONS

- To what extent has India's commitment to international agreements with carbon emission trading mechanisms influenced its domestic energy and environmental policies

- What legal safeguards and dispute resolution mechanisms are in place to protect India's interests in international carbon trading agreements.

- The question is whether the Ministry of Power is the appropriate Ministry to regulate this scheme and whether the market regulator for carbon credit trading should be specified in the Act.

- How can India address legal gaps or deficiencies in its energy policy and carbon trading regulations by drawing from the legal experiences of countries that have implemented such policies.

- Permits may be obtained on the same activity such as Renewable energy, energy savings, and carbon credit certificates. Are these permits Interchangeable?

- How does India's present stand on the export of carbon credits affect the country? Does it foster a domestic carbon credit market aligned with its environmental and economic objectives, and what is the anticipated impact of this policy shift?

RESEARCH HYPOTHESIS

The Carbon Emission Trading (CET) framework, as analyzed through doctrinal research, effectively balances environmental concerns regarding carbon emissions while maintaining or promoting industrial growth and international trade.

RESEARCH METHODOLOGY

The research employs a purely doctrinal research methodology, drawing upon sources such as agreements, draft bills, international reports, WTO reports, journals, government publications, online articles, newspapers, books, and statistical reports and data from reputable organizations.

CHAPTERISATION

Chapter 1: Introduction

It deals with the introduction to this research, including the objectives and methodology used in the study. It further gives an opener as to why Climate Change is a pressing issue that needs to be looked into, to which Carbon Emission Trading may be an effective solution.

Chapter 2: Carbon Emission Trading – A Comprehensive Overview

In this chapter, the focus revolves around carbon credits and their integral role within pollution control and emissions trading programs aimed at mitigating global warming. These credits enable significant reductions in greenhouse gas emissions at an industrial scale while providing financial support for initiatives aimed at lowering carbon output. The Kyoto Protocol formalized the use of carbon trading, where nations achieving reductions in greenhouse gas emissions earn carbon credits. Within carbon markets, these credits are traded, facilitating the offsetting of emissions and supporting sustainable development objectives through cost-effective emission reduction strategies.

Chapter 3: Carbon Emission Trading and India - A Detailed Analysis

This chapter examines India's Carbon Emission Trading (CET) framework, highlighting its evolution and impact on carbon markets and trading systems. It assesses how international agreements influence India's approach to carbon emission trading, emphasizing policy evolution and challenges in implementation. The discussion covers key aspects such as establishing effective

monitoring mechanisms, addressing legal frameworks, and optimizing permit allocation strategies within India's CET policy framework. Insights from international agreements provide benchmarks for enhancing the effectiveness and transparency of India's carbon trading initiatives, crucial for achieving sustainable development goals.

Chapter 4: Interface of CET Policy with Trade - A Global Aspect

This chapter explores the integration of Carbon Emission Trading (CET) with international trade, analyzing their mutual influence on global markets and regulatory frameworks. It examines barriers and incentives within CET frameworks, particularly for developing small-scale industries, to promote sustainable growth and competitiveness. Additionally, CET is explored as a catalyst for advancing green trading practices and fostering technological innovations towards environmental sustainability. Practical insights are provided through a case study illustrating the application and outcomes of CET in real-world contexts.

Chapter 5: Findings And Policy Recommendations

In this concluding chapter, the study emphasizes the significant impact of Carbon Emission Trading (CET) on global markets and regulatory frameworks, particularly its role in fostering sustainable growth and competitiveness for small-scale industries. CET is identified as a critical tool for advancing green trading practices and driving technological advancements towards environmental sustainability. Policy recommendations stress the need for enhanced transparency and efficiency within CET frameworks, alongside measures to incentivize innovation and technology adoption. Overall, CET emerges as pivotal in balancing economic development with environmental stewardship, advocating for adaptable policies to address global environmental challenges effectively.

SCOPE AND RELEVANCE OF THE STUDY

Carbon emission trading (CET) has emerged as a pivotal mechanism in global efforts to mitigate climate change by incentivizing reductions in greenhouse gas emissions. Your research delves into several critical dimensions:

1. International and Regional Agreements: Analyzing various international and regional agreements incorporating CET mechanisms provides insights into global cooperation and regulatory frameworks aimed at addressing climate challenges.

2. India's Compliance and Legal Framework: Evaluating India's compliance with international agreements and its domestic legal obligations concerning CET sheds light on the effectiveness of regulatory measures and enforcement mechanisms.

3. Legislative and Regulatory Analysis: Conducting a comprehensive analysis of India's legislative and regulatory framework governing CET is crucial for understanding policy efficacy and identifying areas for enhancement.

4. Impact on Industrial Growth and Trade: Assessing how CET impacts international trade, particularly whether it acts as a trade barrier or incentive for developing industries, is vital for balancing environmental goals with economic growth.

5. Policy Evaluation and Recommendations: Addressing deficiencies in draft documents and recommending improvements in energy conservation laws and carbon trading regulations can guide policymakers toward more effective environmental management.

LIMITATIONS OF RESEARCH

During the study on Carbon Emission Trading (CET) and its implications, several limitations were encountered. Firstly, the research primarily focused on major international agreements like the Kyoto Protocol and the Paris Agreement, potentially overlooking regional frameworks that also incorporate CET mechanisms. Secondly, challenges arose regarding the availability and accessibility of comprehensive and up-to-date data concerning India's compliance with international agreements and its domestic legislative framework governing CET. This hindered a thorough analysis, particularly regarding specific enforcement measures and regulatory intricacies. Additionally, the complexity of legal and regulatory analysis posed challenges, leading to potential oversimplification or oversight of certain aspects within India's CET framework. Time constraints limited the comprehensive assessment of the Energy Conservation Amendment Act 2022 and its deficiencies, necessitating further longitudinal research for a more exhaustive evaluation of its implementation. Lastly, while the study provides valuable insights into how CET balances environmental concerns with industrial growth and trade dynamics in India, the generalizability of findings may be limited due to variations in economic conditions, policy contexts, and industrial structures across different countries. Future research should address these limitations to provide a more nuanced understanding of CET's impact and regulatory effectiveness in diverse contexts.

LITERATURE REVIEW

The study utilized the following textbooks/articles for the research:

1. **Dr Bruno Zeller, Systems of Carbon Trading, (2009)**

The author has conducted a literature review focusing on the current landscape of carbon trading and its future direction, particularly in response to the mandates of the Kyoto Protocol aimed at implementing cap and trade programs for reducing greenhouse gas emissions. The review

underscores the author's emphasis on the commercial dimension of carbon credits trading, highlighting its potential profitability while acknowledging the overlooked social and environmental implications. Moreover, the author advocates for the establishment of a cost-effective and simplified system to facilitate global carbon credit trading, suggesting that the introduction of a uniform arbitration framework is crucial. The review examines various trading schemes such as market-based trading, Joint Implementations (JI), and the Clean Development Mechanism (CDM), analyzing their cross-border impacts on pricing and international trade agreements, including those under the World Trade Organization (WTO). Overall, the author aims to initiate discourse on developing a sustainable and efficient carbon trading system that effectively reduces greenhouse gas emissions, drawing insights from case studies in the EU, Australia, and the United States.

2. **Amit Mishra et al., Carbon Credit for Sustainable Development, Recent Research in Science and Technology (2014)**

The author has explored the detrimental impact of greenhouse gases, such as carbon dioxide and methane, which disrupt Earth's atmospheric heat balance, resulting in global warming—a significant threat to life on our planet. Critically assessing current pollution control regulations, the author highlights their ineffectiveness, largely due to a lack of attractive incentives for industries. The article discusses the Kyoto Protocol of 1997, endorsed by the United Nations Framework Convention on Climate Change (UNFCCC), as a pivotal solution. It proposes sustainable technologies like hybrid solar/wind electric generators to replace traditional fossil fuel-powered systems, thereby reducing carbon emissions. Additionally, the author examines the concept of carbon sequestration credits, which allow companies and utilities to offset emissions by purchasing credits equivalent to those emitted by polluting sources. This approach not only supports regulatory compliance but also promotes the transition to cleaner energy systems, crucial for mitigating the harmful effects of global warming.

3. **Bandyopadhyay, K.R Emission trading in India: A study of two schemes, 2016.**

The author examines two significant emission trading schemes in India resembling the EU-ETS framework, each addressing distinct environmental and economic challenges. The first scheme pioneers an emission trading system targeting respiratory solid particulate matter (RSPM) in industrial clusters across Gujarat, Maharashtra, and Tamil Nadu. Unlike traditional regulations, this scheme sets pollution targets based on ambient air quality standards and utilizes permits traded according to compliance gains verified through continuous emission monitoring systems (CEMS). This innovative approach mitigates issues associated with spot checks and enhances transparency in emission reporting. The second scheme, the Perform Achieve and Trade (PAT) initiative under the National Mission on Enhanced Energy Efficiency, facilitates energy-saving certificate trading among designated industrial consumers. Although not directly linked to CO2 emissions, the saved energy units can be equivalently converted. The PAT scheme shows promise in bolstering India's emission trading market and potentially integrating with international carbon offsets through

enhanced monitoring, reporting, and verification (MRV). The paper critically reviews the operational mechanisms of these schemes, highlighting their institutional frameworks and exploring avenues for global carbon offsetting collaborations.

4. **Srivastava, R.P., Kumar, S. and Tiwari A, Continuous Emission Monitoring Systems (Cems) In India: Performance evaluation, policy gaps and financial implications for effective air pollution control (2024)**

The author investigates Continuous Emission Monitoring Systems (CEMS), which are pivotal tools for real-time measurement and reporting of air pollutant emissions. While extensively utilized in developed nations to enforce emission standards and improve environmental performance, their implementation in India remains nascent. This study evaluates the efficacy of CEMS in India, identifying barriers related to policy, regulation, technology, and finance that hinder their adoption. Recommendations are made to overcome these obstacles, proposing mechanisms and incentives to facilitate wider deployment. CEMS were found to enhance monitoring accuracy, transparency, accountability, and enforcement capabilities, offering substantial benefits for air pollution control. Institutional challenges, such as the absence of a certification system, lack of quality assurance measures, data validation issues, calibration difficulties, and integration complexities with existing regulations, are highlighted. The study underscores the need for India to develop a comprehensive policy framework and regulatory structure for CEMS, including certification systems and capacity-building initiatives to enhance stakeholder awareness and effectiveness.

5. **Hepburn, C., 2007. Carbon trading: a Review of the Kyoto Mechanisms.**

The author critically examines the three Kyoto flexible mechanisms—emissions trading, the clean development mechanism (CDM), and Joint Implementation (JI)—which have sparked considerable debate. Advocates view these mechanisms as innovative tools to achieve environmental goals at minimal cost, thereby facilitating stricter targets and enhancing political feasibility. Critics, however, argue that these mechanisms commodify the Earth's atmosphere, potentially allowing ineffective projects and the trading of “hot air” to undermine genuine climate action. This chapter provides a comprehensive review of the Kyoto flexible mechanisms, focusing on their implementation from 2008 to 2012. It evaluates their achievements, identifies emerging challenges, and explores recommendations for future climate policy developments.

6. **Gupta, Yuvika., 2011. Carbon credit: A Step Towards Green Environment.**

The author highlights the pressing economic impacts of Global Warming, motivating Green Environmentalists to advocate for environmentally responsible policies and business practices. Carbon dioxide, the primary greenhouse gas from fuel combustion, has sparked global concern due to its escalating atmospheric concentrations. This urgency has spurred the creation of a global “carbon market,” facilitating the trade of carbon credits across regulated regions. Under the Kyoto Protocol, countries are allocated emission limits to manage greenhouse gas emissions from

industries and commercial sectors. The paper aims to elucidate the fundamental concepts and significance of carbon credits while emphasizing methods to safeguard the environment. Furthermore, it explores business opportunities within the global emissions market, particularly within the Indian context.

7. **Verma, M., 2023. Navigating the World of Carbon Credits: Strategies for Emissions Reduction and Market Participation**

The author explores the fundamental concepts and operational strategies surrounding carbon credits and their pivotal role in mitigating climate change through incentivized emissions reductions. Carbon credits serve as critical instruments for offsetting emissions from diverse sectors like energy production and transportation, traded within established carbon markets. Each credit represents a metric ton of carbon dioxide equivalent avoided or sequestered. The review underscores the significance of carbon credits in global efforts to combat climate change, highlighting their regulatory framework, trading mechanisms, and ongoing evolution within international climate initiatives.

8. **Narassimhan, E., Gallagher, K.S., Koester, S. and Alejo, J.R., 2018. Carbon pricing in practice: A review of existing emissions trading systems.**

The author examines the implementation of emissions trading systems (ETSs) across eight jurisdictions, including the EU, Switzerland, RGGI, California, Québec, New Zealand, South Korea, and pilot schemes in China. The analysis evaluates each ETS based on environmental effectiveness, economic efficiency, market and revenue management, and stakeholder engagement. Key attributes such as abatement costs, cap stringency, allocation practices, and price stability trajectories are scrutinized to understand the operational strengths and weaknesses of each system. Institutional learning, administrative resilience, effective revenue management, and stakeholder involvement emerge as critical factors contributing to successful ETS regimes. The study highlights significant advancements in administrative and regulatory structures in jurisdictions like California, Québec, and South Korea, influenced by prior experiences such as the EU ETS. It also suggests the potential for achieving 'double dividends' in emissions reduction through incremental carbon pricing and reinvestment of auction revenues into additional mitigation activities. However, knowledge gaps remain concerning the interaction of pricing instruments with other climate policies and the optimal management of these strategies to achieve cost-effective emissions reductions.

9. **Chungyalpa, W., 2020. Examination And Analysis of The Central Pollution Control Board and The State Pollution Control Board-Indian Administrative Arm For Environmental Protection.**

The author examines India's persistent environmental challenges despite a plethora of legislative measures aimed at protection and conservation. India ranks among the world's most polluted nations due to inadequate monitoring, implementation, and enforcement of environmental laws.

This paper focuses on evaluating the administrative framework of the Ministry of Environment, Forest and Climate Change (MoEFCC). Divided into three sections, the paper first provides an overview of the MoEFCC's administrative setup. The second section addresses major issues and offers recommendations regarding the functioning of the Central Pollution Control Board (CPCB) and State Pollution Control Boards. Lastly, the paper assesses the continued relevance of issues highlighted in a 2006 study, examining current literature and publications. It also critiques the role of the National Green Tribunal (NGT) and discusses ongoing challenges within its jurisdiction.

10. **Nair, S. and Nandakumar, P., 2013. Environmental Carbon Trading Scenario in India: A Global Issue Of 21st Century: A Review**

The author highlights climate change and environmental conservation as paramount issues of the 21st century. India, being the second most populous nation, fourth largest in energy consumption, and third largest greenhouse gas emitter, faces significant challenges. The country's extensive use of fuel wood, ten times more than the United States, underscores its environmental impact. To mitigate global emissions, India engages in environmental carbon trading based on carbon credits earned. Coal-fired power generation stands out as India's largest polluter and offers substantial opportunities for emission reduction, thereby becoming a major producer of carbon credits. Currently, India ranks second globally after China in generating carbon credits, leveraging its lower carbon emission levels compared to developed nations. This provides Indian industries ample opportunities to produce carbon units and capitalize on trading benefits, with average annual Certified Emission Reductions (CERs) standing at 12.6% or 11.5 million, potentially increasing to 25%.

11. **Babiker, M., Reilly, J. and Viguier, L., 2004. Is International Emissions Trading Always Beneficial?**

The author argues that economic efficiency, a primary justification for international emissions trading under the Kyoto Protocol, can result in welfare losses for countries despite benefiting private trading entities. This phenomenon resembles “immiserizing” growth as described by Bhagwati, where gains from trade are nullified by negative terms of trade and tax interaction effects. Using simulation and welfare decomposition analysis based on a Computable General Equilibrium (CGE) model of the global economy, the study illustrates that countries acting as net sellers of permits in EU-wide trading schemes tend to incur losses. These losses primarily stem from the existence of distortionary energy taxes, underscoring the complex and nuanced welfare implications associated with emissions trading mechanisms.

12. **Upadhyaya, P., 2020. Is Emission Trading a Possible Policy Option for India?**

The author discusses the importance of domestic climate mitigation actions alongside international negotiations, proposing emissions trading schemes (ETS) as a potential policy tool for promoting mitigation efforts, yet noting its absence in developing countries. The paper provides an overview of India's climate change discourse, its existing carbon markets, and governmental strategies aimed

at addressing climate challenges. The feasibility of implementing an ETS in India is examined through political and institutional lenses, particularly in relation to established mechanisms like the Clean Development Mechanism (CDM), the proposed 'Perform, Achieve and Trade' (PAT) scheme, and potential Nationally Appropriate Mitigation Actions (NAMAs). Key design considerations such as regulatory scope, greenhouse gas sources, and allocation methods are evaluated in the Indian context, highlighting anticipated challenges should an ETS be considered as a policy option. Ultimately, the analysis suggests that immediate implementation of an ETS may not be viable for India at present.

CHAPTER 2:
CARBON EMISSION TRADING
– A COMPREHENSIVE OVERVIEW

Introduction: The Role and Significance of Carbon Market and Carbon Trading

Carbon markets serve as intricate trading platforms facilitating the exchange of carbon credits among organizations. These credits enable entities to offset their greenhouse gas emissions by acquiring credits from counterparts engaged in emissions reduction efforts. Each carbon credit, representing one tonne of CO2 mitigation or its equivalent in other greenhouse gasses, contributes to emission reduction initiatives before being withdrawn from the market. Recent assessments by the Intergovernmental Panel on Climate Change (IPCC - 2019) underscore the ongoing challenges in curbing greenhouse gas emissions. Addressing the climate crisis requires substantial financial investments, particularly in developing nations where funding gaps for climate-related projects remain pronounced. However, the current financial inflows fall short of the levels envisaged for 2030, emphasizing the imperative for increased investments in climate mitigation and adaptation endeavors.[18]

Carbon markets have emerged as potential mechanisms to drive and finance the transformative actions necessary to combat climate change. These markets offer pathways to incentivize emission reductions and mobilize resources, thereby facilitating global efforts aimed at enhancing climate resilience and sustainability.[19] In light of the urgency posed by the crisis, Carbon Emission Trading assumes a pivotal role in addressing the climate challenge by harnessing its positive attributes. The significance of carbon trading emanates from its multifaceted role in driving cost-effective

[18] Dzebo, A., Janetschek, H., Brandi, C. and Iacobuta, G., 2019. Connections between the Paris Agreement and the 2030 Agenda. The case for policy coherence, 38.

[19] What are carbon markets and why are they important? UNDP Climate Promise, https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important

emissions reductions and accommodating diverse policy imperatives.[20] As a mechanism designed to incentivize emission mitigation in a financially prudent manner, carbon trading systems occupy a crucial position within the legal and regulatory frameworks governing climate action. The inception of the Kyoto Protocol in 1997 marked a pivotal moment in the global embrace of carbon markets, despite challenges stemming from the absence of key players such as the US and China.[21] However, a transformative shift occurred in 2015 with the adoption of the Paris Agreement during COP 21. This landmark treaty aimed to address climate change by setting global emission targets and holding nations accountable for their efforts to reduce carbon emissions. One of the primary mechanisms introduced to enforce accountability under the Paris Agreement was the implementation of Cap & Trade systems. These systems facilitated the trading of carbon credits, issued as part of the emission cap framework. Jurisdictions adopting such systems mandated participation in compliance carbon markets, while voluntary market engagement remained discretionary.[22] These markets are characterized by a high degree of homogeneity due to stringent controls and oversight by the same governing body responsible for generating and overseeing carbon credits. A parallel compliance market ensures the reliability and quality of carbon credits within Cap & Trade systems, thus fostering an efficient and trustworthy trading environment. Conversely, voluntary markets operate with less regulatory scrutiny, with participants focusing on creating and exchanging carbon offsets rather than carbon credits.[23]

Integral to the functioning of carbon markets is the concept of carbon accounting, also known as greenhouse gas accounting. This practice serves as the foundation for evaluating and quantifying carbon emissions, playing a crucial role not only in carbon market operations but also in broader Environmental, Social, and Governance (ESG) analyses.[24] Primarily, carbon trading systems are conceived as instrumental avenues for achieving emissions reductions, embodying the principle of market-driven environmental governance. Their establishment is underpinned by the recognition that market-based mechanisms offer an efficient means of internalizing the externalities associated

[20] Oliveira, T.D., 2018. An investigation into the compatibility and effectiveness of linking Brazilian carbon mitigation and trading strategies with the EU ETS (European Union Emissions Trading Scheme) (Doctoral dissertation, Institute of Technology, Sligo).
[21] OEF-132.pdf, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2022/06/OEF-132.pdf
[22] Calel, R., Dechêzlepretre, A. and Venmans, F., 2023. Policing carbon markets.
[23] Carbon Markets Corporate Finance Institute, https://corporatefinanceinstitute.com/resources/esg/carbon-markets/
[24] Jinga, P., 2021. The increasing importance of Environmental, Social and Governance (ESG) Investing in combating climate change. Environmental Management-Pollution, Habitat, Ecology, and Sustainability.

with carbon emissions, thereby incentivizing emissions abatement while minimizing economic distortions.[25] The importance of carbon trading extends beyond mere emissions reduction objectives. These systems are integral components of broader policy agendas aimed at sustainable development, encompassing diverse socioeconomic considerations such as economic growth, energy access, air quality improvement, and energy security. Consequently, carbon trading mechanisms are situated within a complex web of legal and policy frameworks, reflecting the interconnectedness of environmental, economic, and social imperatives.

Navigating the Carbon Market Landscape: A Journey from the Origins

The evolution of emissions trading systems underscores their adaptive nature, responsive to changing regulatory landscapes and technological advancements. As these systems evolve, their roles and functions may shift, reflecting alterations in cap stringency, pricing mechanisms, sectoral coverage, and allowance allocation methodologies. This dynamic evolution underscores the need for legal frameworks that are flexible yet robust, capable of accommodating changing circumstances while upholding the integrity and efficacy of carbon trading mechanisms.

Two primary types of Emissions Trading Systems (ETS) have emerged: 'cap and trade' and 'baseline and credit.' The EU ETS serves as a prominent example of the former, where the European Commission sets a cap on emissions for a specific period and allocates or auctions allowances to industries and companies within the cap. As the cap diminishes over time, the price of allowances typically rises, incentivizing investments in emissions reduction. In the Rocky Mountain Farmers Union v. Corey (2013)[26] case, the Ninth Circuit upheld California's Low Carbon Fuel Standard as part of the state's cap-and-trade program, ruling it did not violate the Commerce Clause, thus supporting emissions reduction efforts. Conversely, under the baseline and credit system, regulated emitters are provided with a baseline and are required to surrender credits if their emissions exceed the limit or can earn credits if they manage to reduce emissions below the set limit. These credits can then be traded among emitters. An example of this system is the newly

[25] Defining the role – Implementing Effective Emissions Trading Systems – Analysis IEA, https://www.iea.org/reports/implementing-effective-emissions-trading-systems/defining-the-role
[26] Rocky Mountain Farmers Union v. Corey, No. 12-15131 (9th Cir. 2013)

established China ETS, where companies receive allowances based on verified emissions and can trade them upon successfully reducing their carbon intensity.[27]

Different nations exhibit varying sectoral coverage within global carbon markets. While some, like the Regional Greenhouse Gas Initiative in North America, primarily focus on the electricity sector[28], others encompass additional sectors such as industrial, building, and transportation. New Zealand, for instance, covers its entire energy economy.[29] According to the International Carbon Action Partnership (ICAP), there are currently 25 operational ETS systems worldwide, with the World Bank's Carbon Pricing Dashboard recording 30 carbon pricing initiatives.[30] Discrepancies in defining ETSs scheduled for implementation may account for the difference in counts. ICAP also identifies 22 additional ETSs under development or consideration. In terms of emissions coverage, ICAP reports that 17% of global greenhouse gas emissions are now encompassed by an ETS.[31] Furthermore, it notes that 37% of emissions in countries or regions with net-zero targets are covered by an ETS, contrasting with 17% coverage in areas lacking a net-zero target.[32]

The policy process and vision behind the trading scheme set the stage, while the legal model acts as the sturdy framework that breathes life into its design. The United Nations Framework Convention on Climate Change ("UNFCCC") pledges are strengthened by the Kyoto Protocol, founded in 1997. Discussions at the UNFCCC's Seventh Conference of the Parties, also referred to as the Marrakesh Accord, resulted in an agreement on adaptable measures meant to lower greenhouse gas emissions. A number of countries, most notably the EU, have made progress in achieving their goals to reduce greenhouse gas emissions in the upcoming years. The European Council restated its position that industrialized countries should cut emissions between 60% and 80% by the year 2050 when compared to 1990 levels. The European Commission also released a

[27] Emission trading systems - OECD, https://www.oecd.org/environment/tools-evaluation/emissiontradingsystems.htm

[28] Ruth, M., Gabriel, S.A., Palmer, K.L., Burtraw, D., Paul, A., Chen, Y., Hobbs, B.F., Irani, D., Michael, J., Ross, K.M. and Conklin, R., 2008. Economic and energy impacts from participation in the regional greenhouse gas initiative: A case study of the State of Maryland. Energy Policy, 36(6), pp.2279-2289.

[29] Bicknell, K.B., Ball, R.J., Cullen, R. and Bigsby, H.R., 1998. New methodology for the ecological footprint with an application to the New Zealand economy. Ecological economics, 27(2), pp.149-160.

[30] Narassimhan, E., Gallagher, K.S., Koester, S. and Alejo, J.R., 2017. Carbon pricing in practice: a review of the evidence. *Climate Policy Lab: Medford, MA, USA*.

[31] Bicknell, K.B., Ball, R.J., Cullen, R. and Bigsby, H.R., 1998. New methodology for the ecological footprint with an application to the New Zealand economy. Ecological economics, 27(20)

[32] id

communication in 2006 with the title "Building a Global Carbon Market-Report pursuant to Article 30 of Directive 2003/87/EC."

Three schemes have emerged under the Kyoto Protocol:

1. The Clean Development Mechanism (CDM)
2. Joint Implementation (JI), and
3. A market-based flexible emission trading plan.[33]

The Clean Development Mechanism (CDM), as outlined in Article 12 of the Kyoto Protocol, enables Annex I countries with emission reduction obligations to implement carbon emission reduction projects in non-Annex I countries. These projects generate certified emission reduction (CER) credits, each equivalent to one ton of carbon dioxide, which can be used to meet Kyoto targets. Essentially, it involves a developed country investing in a project in a developing country, with the emissions reductions achieved counting towards the developed country's targets. CDM projects can range from installing energy-efficient boilers to implementing rural electrification using solar panels. While seen as innovative, there are concerns about the credibility of emissions reductions, especially since CDM projects are often set up in Annex II countries to fulfill emission targets of Annex I countries. India has the largest number of registered CDM projects, overseen by the National CDM Authority (NCDMA). As of May 2013, the NCDMA had approved approximately 2,800 projects, with 40% registered with the UNFCCC, 25% undergoing validation, 10% awaiting final approval, and 25% either withdrawn, terminated, or rejected.[34]

Joint Implementation (JI), as described in Article 6 of the Kyoto Protocol, enables an Annex I country to collaborate on a Certified Emission Reduction (CER) project in another Annex I or Annex II country where the cost of emission reduction is lower. This mechanism allows countries to reduce the cost of meeting their Kyoto targets by lowering greenhouse gas emissions in a different Annex I country. Essentially, countries can work together to achieve emission reductions and fulfill their targets collectively. Most JI projects are anticipated to occur in Annex II countries

[33] Dr Bruno Zeller, Systems of Carbon Trading, 25 TOURO L. REV. 909 (2009) page 916

[34] E. M. Addis, *Opportunity, Challenge and Achievements of Global Carbon Trading: Review Paper*, Journal of Resources Development and Management (2015), https://www.semanticscholar.org/paper/Opportunity%2C-Challenge-and-Achievements-of-Global-Addis/1700926a46d031c5c42f909136c3397fb8cccb4c

of the Kyoto Protocol.[35] Currently, Ukraine and Russia host the majority of JI projects. Unlike the Clean Development Mechanism (CDM), JI projects raise fewer concerns about spurious emission reductions because they involve collaboration between Annex I countries. The process of obtaining credits for JI projects is complex. Emission reduction projects generate Emission Reduction Units (ERUs), each representing an emission reduction equivalent to one ton of CO2. These ERUs are derived from the host country's pool of allocated emissions credits known as Assigned Amount Units (AAUs).[36] Each Annex I party has a predetermined limit of AAUs based on its 1990 greenhouse gas emission levels. By requiring JI credits to originate from the host country's pool of AAUs, the Protocol ensures that the total number of emissions credits among Annex I countries remains unchanged during the Kyoto Protocol's first commitment period. An example of a JI project could involve replacing a coal-fired power plant with a more efficient combined heat and power plant. Figure 2.1 (given after explanation) illustrates the three mechanisms of the Kyoto Protocol. International Emission Trading (IET) operates on an allowance-based mechanism, wherein developed nations commit to targets for reducing or constraining Greenhouse Gas (GHG) emissions. These targets, expressed as permissible emission levels, are referred to as assigned amounts, and the total allowable emissions are divided into Assigned Amount Units (AAUs).[37] IET enables countries with surplus emission units, meaning emissions allowances that are permitted but not utilized, to sell this excess capacity to nations that exceed their targets. Consequently, both developing and developed countries can engage in trading AAUs. The aforementioned mechanisms collectively aim to decrease greenhouse gas emissions through environmental means, effectively introducing a new commodity for trading. Given that carbon dioxide is the primary greenhouse gas, carbon emerges as the key element in such trading, functioning similarly to any other tradable commodity. This trading framework establishes what is commonly referred to as the "Carbon Market." Among these mechanisms, Joint Implementation and International Emission Trading are designated for developed countries, while the Clean Development Mechanism serves as the mechanism for developing nations. As per the United Nations' Country Classification Report for 2021, India falls under the category of a developing

[35] What is the Kyoto Protocol? | UNFCCC, https://unfccc.int/kyoto_protocol

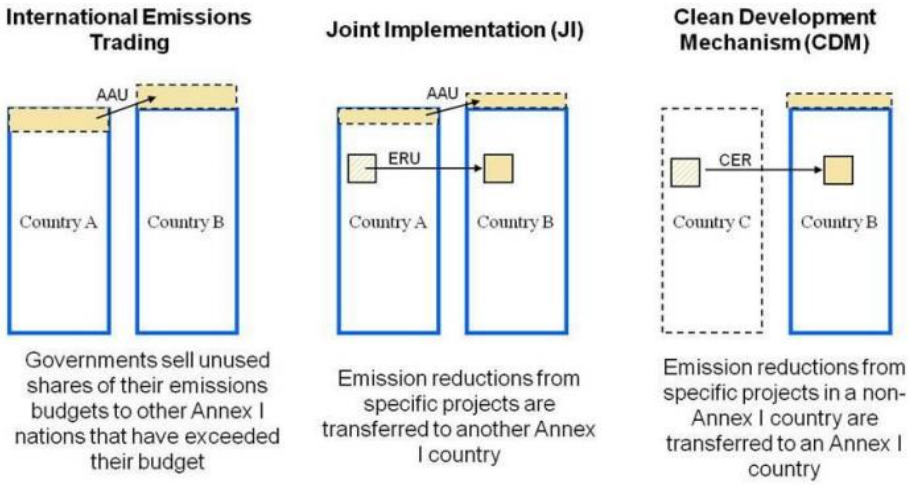
[36] Farhana Yamin, *Joint implementation*, 10 Global Environmental Change 87–91 (2000), https://www.sciencedirect.com/science/article/pii/S0959378000000054 (last visited May 7, 2024)

[37] Edwin Woerdman. (2000, January). Implementing the Kyoto protocol: why JI and CDM show more promise than international emissions trading. *Energy Policy*, *28*(1), 29–38. https://doi.org/10.1016/S0301

country,[38] making the Clean Development Mechanism the most appropriate mechanism for our nation. In the context of CDM, the tradable commodity is Certified Emission Reductions (CERs) credits,[39] commonly known as Carbon Credits, and the trading of these credits in the carbon market is referred to as Carbon Credits Trading (DESA, UN, 2017).

These solutions were designed to be adaptable in order to control greenhouse gas emissions in all areas.[40] To put it simply, while CDM concentrates on projects in developing countries without such targets, emission trading and joint industrialization (JI) systems enable trade among nations with emission targets.

Figure 2.1 – Three Mechanisms of Kyoto Protocol



Source: UNFCCC

International cooperation is essential in addressing the interconnected environmental, economic, and social factors of climate change. Emissions from any nation contribute to the global concentration of greenhouse gasses (GHGs), necessitating synchronized international efforts to

[38] Dandona, L., Dandona, R., Kumar, G.A., Shukla, D.K., Paul, V.K., Balakrishnan, K., Prabhakaran, D., Tandon, N., Salvi, S., Dash, A.P. and Nandakumar, A., 2017. Nations within a nation: variations in epidemiological transition across the states of India, 1990–2016 in the Global Burden of Disease Study. The Lancet, 390(10111), pp.2437-2460.
[39] Michaelowa, A., 2014. Linking the CDM with domestic carbon markets. Climate Policy, 14(3), pp.353-371.
[40] Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., O'Mara, F., Rice, C. and Scholes, B., 2007. Policy and technological constraints to implementation of greenhouse gas mitigation options in agriculture. Agriculture, ecosystems & environment, 118(1-4), pp.6-28.

enhance mitigation strategies. While developing countries often prioritize economic growth over environmental sustainability due to pressing developmental needs, integrating sustainable practices can yield long-term economic benefits such as job creation in the green economy, enhanced energy security, and reduced healthcare costs from pollution-related illnesses. Furthermore, emission reduction efforts have significant social implications, including improved public health, education, and overall quality of life. By fostering international cooperation, the benefits of emission reduction can be equitably distributed, addressing environmental justice issues and supporting vulnerable populations. These mechanisms aim to promote greenhouse gas (GHG) reduction efforts in the most cost-effective locations, often beginning in developing nations. The primary goal is to remove emissions from the atmosphere, regardless of where the reduction occurs. This approach offers dual advantages: stimulating environmentally friendly investments in developing countries and engaging the private sector in efforts to mitigate GHG emissions and maintain them at sustainable levels.[41] Additionally, it facilitates the concept of leap-frogging, wherein older, more polluting technologies are bypassed in favor of newer, cleaner infrastructure and systems, resulting in long-term benefits.[42] The Paris Agreement signifies a pivotal accord aimed at galvanizing near-universal participation among nations to confront the pressing challenge of climate change. A watershed moment in global diplomacy, the agreement unifies nations under a common banner for the first time in history.[43] Central to its mandate is the reinforcement of the collective global response to the existential threat posed by climate change, with a primary objective of constraining the escalation of global average temperatures to well below 2 degrees Celsius above pre-industrial levels, while diligently pursuing efforts to limit the temperature increase to 1.5 degrees Celsius. Moreover, the agreement endeavors to fortify the adaptive capacity of member nations to contend with the multifaceted impacts of climate change.

In pursuit of these ambitious aims, the agreement underscores the imperative of mobilizing adequate financial resources, leveraging cutting-edge technological innovations, and fostering robust capacity-building endeavors. Of particular emphasis is the need to support developing

[41] Pinkse, J. and Kolk, A., 2012. Addressing climate change—sustainable development nexus: The role of multistakeholder partnerships. Business & Society, 51(1), pp.176-210.
[42] What is the Kyoto Protocol? | UNFCCC, https://unfccc.int/kyoto_protocol
[43] Christina Voigt, *The power of the Paris Agreement in international climate litigation*, 32 Review of European, Comparative & International Environmental Law 237–249 (2023), https://onlinelibrary.wiley.com/doi/abs/10.1111/reel.12514 (last visited May 7, 2024)

nations and the most vulnerable states in aligning climate action with their national priorities. Concurrently, the agreement advocates for enhanced transparency in reporting actions and facilitating support mechanisms through a robust transparency framework, heralding a paradigm shift in international climate governance.[44] Embedded within the Paris Agreement is the requirement for all member nations to submit their nationally determined contributions (NDCs) and progressively enhance these commitments over time. This necessitates a systematic and iterative process of monitoring emissions and tracking implementation efforts. The negotiation of the treaty's language during the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris represented a culmination of deliberations involving representatives from 197 countries.[45] The unanimous adoption of the agreement on 12 December 2015 underscored a rare moment of consensus in global climate diplomacy. Subsequent to its adoption, the Paris Agreement garnered widespread support, with 197 UNFCCC parties signing the agreement by December 2016, and 118 parties ratifying it. The agreement crossed the threshold for implementation on 5 October 2016, officially entering into force on 4 November 2016. Notably, the inaugural meeting of the COP 21, serving as the maiden Meeting of the Parties to the Paris Agreement, convened in Marrakech, Morocco from 15-18 November 2016, setting the stage for ongoing collective action on climate change mitigation and adaptation.

The EU launched carbon trading in 2005, marking a historic milestone as the first global multilateral emissions trading program and serving as a model for the global program created under the Kyoto Protocol.[46] Businesses that meet or exceed their emissions reduction targets can trade emission permits. To facilitate trade, it is imperative to keep the cost of licenses below the cost of producing pollutants. Consequently, multinational corporations often focus their emission reduction efforts in areas with lower costs while purchasing permits from those with more reasonable prices.[47] The Australian strategy mirrors that of the EU but introduces an additional element: a combination of free trade procedures with the introduction of an auction system.

[44] Bäckstrand, K., Kuyper, J.W., Linnér, B.O. and Lövbrand, E., 2017. Non-state actors in global climate governance: from Copenhagen to Paris and beyond. Environmental Politics, 26(4), pp.561-579.

[45] The negotiation of the treaty's language during the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris represented a culmination of deliberations involving representatives from 197 countries.

[46] Hepburn, C., 2007. Carbon trading: a review of the Kyoto mechanisms. Annu. Rev. Environ. Resour., 32, pp.375-393.

[47] Dr Bruno Zeller, Systems of Carbon Trading, 25 TOURO L. REV. 909 (2009)

However, the global implications of auction-based systems pose challenges, necessitating the creation of new international legal frameworks. The NDCs' implementation will depend substantially on carbon financing, which the Paris Agreement's Article 6 permits the use of. Because of this, there is a growing interest in carbon markets globally; 83 percent of NDCs indicate that they want to employ global market mechanisms to cut greenhouse gas emissions. At the core of COP26 in Glasgow were negotiations pertaining to the functioning of the Article 6 procedures under the Paris Agreement. After choices were made there, the "Paris Rulebook" for putting the Agreement into practice was deemed finished. There are still a few details that must be worked out, though. At COP27, more progress was made, and talks will continue at the UNFCCC conference in Bonn, Germany, and at COP28 in Dubai.[48]

It is noteworthy that the global carbon dioxide (CO2) emissions totaled 2,06,07,832 Kt in 1990, a figure that escalated to 2,33,11,806 Kt by the year 2000. This consistent uptrend in emissions persisted over the course of a decade, culminating in a recorded emission level of 3,10,31,799 Kt by 2010. Such a gradual escalation in emissions correlated with a corresponding rise in Earth's temperatures, exacerbating the phenomenon of global warming. Subsequently, by the year 2020, emissions surged further, reaching a staggering 3,40,40,000 Kt. This persistent escalation in emissions underscores the urgent necessity for concerted global efforts aimed at mitigating greenhouse gas emissions and alleviating the adverse impacts of climate change.[49] Sustainable energy transitions, bolstered regulatory frameworks, and international collaboration are indispensable in addressing the underlying causes of emission proliferation and safeguarding the ecological equilibrium of the planet for future generations. Throwing light upon the collected data, accumulating in a greater magnitude - 28% CO2 emissions are created by China, 15% of emissions created by the United States, 9% by the EU-28, 7% by India, 5% by the Russian Federation, 3% by Japan, and 34% by other countries indicating that these countries were responsible for the warming of Earth to a greater extent. It is the endeavor to focus on the dominant greenhouse gas carbon-dioxide which constituted more than 80 per cent in the gasses, which ought to be normally at 0.03 percent.[50]

[48] What are carbon markets and why are they important? UNDP Climate Promise, https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important

[49] Izuchukwu, A., Asomah, J.K. and Onoh, U.C., Assessing the Impact of Global Agreements on Combating Climate Change and Advancing Sustainable Development and Global Climate Change.

[50] Lehman Brothers. Global warming may melt Indian economy, The Economic Times, September, 22, 2007

As we talk about the Carbon Emission Trading, it is highly imperative that we speak of the significance the carbon market has displayed in the field. The very same can be seen over the expanse of the last 15 years in the case of countries like Portugal and Mexico, who had incorporated carbon taxes.[51] California and Quebec are the two countries which have linked their cap-and-trade system. China has gleaned valuable insights from its seven local carbon markets, positioning itself as a frontrunner among nations and a notable emitter of greenhouse gasses. Its strategic endeavors included the planned launch of a national emissions trading system in 2016. Similarly, Chile embarked on the path of carbon pricing, formalizing a carbon tax initiative in 2018.[52] Presently, a collective of 46 national and 24 sub-national governments have embarked on carbon pricing ventures. According to data from the World Bank, revenues stemming from carbon pricing surpassed the $20 billion mark in 2016. Moreover, an impressive cohort of over 1,400 companies, inclusive of more than 100 Fortune Global entities, have integrated internal carbon pricing mechanisms into their corporate frameworks. Over the span of the last 10 years, the momentum behind carbon pricing has grown effectively and tripled by the facts placed by statistics. The carbon pricing initiative was adopted by the countries and it covered around 20% of the global GHGs which approximately rounded off to 15% in the year 2017.

According to data provided by the World Bank in 2018, governmental bodies accrued approximately US$33 billion in revenue from carbon pricing initiatives in 2017, marking a substantial increase from the $22 billion obtained in 2016. The subsequent year, 2019, witnessed a proliferation of carbon pricing instruments within carbon markets worldwide, resulting in a remarkable 34% surge in the total value of these markets to reach $194 billion. Furthermore, in 2020, the global valuation of carbon markets experienced a noteworthy 20% expansion, reaching a total of €230 billion. This trend underscores the fourth consecutive year of growth in carbon market valuation.[53] Notably, this market mechanism has emerged as a unique solution to partially mitigate the adverse environmental impacts associated with market capitalism by instituting a market for emissions.

[51] "World Bank Group; ECOFYS. Carbon Pricing Watch. Washington, DC: World Bank.2016
[52] World Bank's State and Trends of Carbon Pricing 2016-2019
[53] "World Bank Group; ECOFYS. Carbon Pricing Watch. Washington, DC: World Bank.2016

Understanding the Carbon Credit System

Carbon Credit serves as a tool aimed at diminishing the level of carbon dioxide or greenhouse gas emissions attributable to a project or the manufacturing processes of any entity. As stipulated by the Kyoto Protocol, the value of one carbon credit corresponds to the reduction of one ton of carbon-dioxide.

1 carbon credit = 1 Ton of Carbon Dioxide Reduction[54]

The genesis of this concept lies in the collective efforts of numerous countries to safeguard the environment. Carbon credits, acknowledged for their role in mitigating or averting the impacts of global warming, constitute a fundamental element of global carbon emission trading.[55] This trading framework offers a means to systematically reduce greenhouse gas emissions on an industrial scale, accompanied by financial incentives derived from the sale of these carbon credits to various participating organizations. These credits can be traded among different entities or transacted in the global market at prevailing market rates. Growing awareness of the need for pollution control led to the creation of the concept of carbon credits. A fundamental part of national and international emissions trading programs designed to mitigate or prevent the effects of global warming are carbon credits. Through lowering annual total emissions and allowing the market to value any shortage through trade, they offer a means of reducing greenhouse emissions on an industrial scale.[56] Credits can be used to finance carbon reduction initiatives amongst trading partners and globally. They can also be traded between enterprises or bought and sold on international markets at the going rate. It was made official by the international pact known as the Kyoto Protocol, which brought 169 nations together. Certificates of achievement in the form of carbon credits are given to nations that successfully lower their greenhouse gas emissions. The Kyoto Protocol led to the creation of carbon trade as a response to the awareness of the dangerous circumstances caused by global warming. As a result, industrialized nations set goals for themselves to lower greenhouse gas emissions by implementing internal production unit reduction

[54] Gupta, Y., 2011. Carbon credit: a step towards green environment. Global Journal of Management and Business Research, 11(5), pp.16-19.
[55] Tripathi, A. (2019). Carbon Credit Management and Strategies to Combat GHGs Emission: An Overview of the Carbon Market. *Indian Journal of Economics and Development*, *15*(4), 619-625.
[56] Enkvist, P., Nauclér, T. and Rosander, J., 2007. A cost curve for greenhouse gas reduction. McKinsey Quarterly, 1, p.34.

strategies. Since it is not possible to shut down manufacturing facilities, the countries promised to maintain the balance of greenhouse gas emissions by compelling developing nations to implement policies to cut back on greenhouse gas emissions, either by cutting their own emissions or by supporting policies like establishing projects that advocate the use of alternative energy sources that cut carbon emissions, such as the promotion of pollution-reducing products and plantation-related initiatives. Therefore, since the notion of carbon credits allows for lowering emissions as the goal of the company, it is a very effective strategy to lessen the effects of pollution it may tend to create. Recognizing the impracticality of outright cessation of industrial activities, both developed and developing nations committed to emission reduction targets, necessitating the implementation of strategies within their manufacturing sectors.[57] These strategies encompass initiatives promoting the adoption of renewable energy sources and afforestation. Consequently, Carbon Credits Trading emerges as a pivotal tool for mitigating environmental pollution, aligning business objectives with the imperative of carbon emission reduction. For businesses, power plants, and consumers looking to reduce expenses or earn additional revenue while adhering to their environmental and pollution control pledges, carbon credits constitute an alluring option. They contribute significantly to the fight against global warming, increase the return on investments made in environmentally friendly projects, while serving as a source of supplemental revenue.[58]

Carbon Credits Trading Network

In the operational framework of carbon credits trading, a developed nation, facing high domestic costs for reducing greenhouse gas emissions, initiates clean technology projects in other nations, either developed or developing, where the cost of such projects is comparatively lower.[59] This engagement occurs within the parameters of the Clean Development Mechanism. Following project implementation, the initiating nation accrues carbon credits, while the recipient nation

[57] Athale, G. A. (2007). State Sugar Mill in Carbon Credits race. Retrieved from http://economictimes.com/carbon-credits-sugar-mill on July 27, 2011.
[58] Amit Mishra et al., *Carbon credit for sustainable development*, Recent Research in Science and Technology (2014)
[59] NCDMA (2014). Carbon Credit Trading Network. Retrieved from www.cdmindia.gov.in/constitution.php on March 5, 2017.

benefits from access to clean technology and financial incentives.[60] Subsequently, the nation possessing carbon credits is permitted to trade them in the global market under international emission trading regulations, thereby fulfilling emission reduction commitments and obligations. The networking of carbon credit systems is thus a global process and one that calls for the need to talk about Carbon Capture and Storage.

Carbon Capture and Storage (CCS)

The contemporary approach known as "Carbon Capture and Storage (CCS)" represents an effective method for mitigating atmospheric carbon emissions, particularly on a large scale. Fossil fuel power plants emerge as primary targets for carbon capture, while other industrial sectors such as chemical plants, steel manufacturing units, and cement industries also offer significant opportunities for capturing carbon dioxide.[61] Moreover, geological formations like depleted gas and oil reservoirs, as well as saline aquifers, serve as viable sites for storing captured carbon, further enhancing the potential of CCS as a global carbon mitigation strategy.

Obtaining Carbon Credits

Carbon credits represent financial instruments wherein one entity compensates another to undertake measures aimed at reducing its greenhouse gas emissions, thereby allowing the paying entity to claim credit for the emission reduction achieved.[62]

Securing carbon credits can indeed present considerable challenges, particularly due to the stringent documentation, verification procedures, and compliance standards integral to the process. Factors such as project intricacy, regulatory requisites, and market intricacies can further exacerbate the complexities associated with obtaining carbon credits, necessitating meticulous attention and resource allocation from participating entities.[63]

The difficulty may vary from situation to situation depending on the state laws and regulations

[60] Amit Mishra et al., Carbon credit for sustainable development, Recent Research in Science and Technology (2014)
[61] Bains, P., Psarras, P. and Wilcox, J., 2017. CO2 capture from the industry sector. Progress in Energy and Combustion Science, 63, pp.146-172.
[62] Corbett, C. (2007). Counting Carbon Credits. Retrieved from http://www.arabianbusiness.com/counting-carbon-credits, July 17, 2011.
[63] Carbon Credits: Basics, Regulations, And Issuance Process, https://eos.com/blog/carbon-credits/

governing the carbon trading and emissions reductions policies that have been brought about by the state. However, the expected procedure in obtaining the same can be stated as below-

- Identification of specific areas of a project where the emissions can be reduced.
- Identification of a suitable CDM project and calculate the value of carbon emission reduction in that project.
- Before deciding the baseline, collection of all the data regarding the emission of greenhouse gasses without investment are provided.
- Comparison of the above baseline with the lower carbon emission after investment in Clean Development Mechanism.
- At last, in Joint Implementation projects, if the carbon reduction is achieved, only then carbon credits can be sold.

As stated above, the procurement of the certificates or the credits might not be an easy task. For the trading of carbon credits, several documents are necessary, with the primary document being the "Letter of Approval" issued by the host country.[64] A third-party validation and certification organization plays a crucial role in certifying both the seller and the buyer for engaging in carbon credit trading activities. The value of a single carbon credit is approximately US$30. When we compare this to the cost of storing a tonne of carbon, which ranges from US$20 to US$25 per tonne, we can see that there's a potential profit margin of about US$5 per Carbon Credit or CER credit. This profit margin represents the difference between the cost of storing carbon and the market value of a carbon credit. Considering this, it offers an appealing opportunity for industries, power plants, and consumers to earn extra income or reduce costs while fulfilling their pollution control commitments and embracing eco-friendly practices. This serves as a chance to generate revenue through eco-friendly initiatives for many Indian companies and those in other developing nations as well. Consequently, they may adopt cleaner technologies and start trading their carbon credits with companies in the US and the European Union, which serves as the very foundation to the concept of Carbon Trade Exchange.

[64] Morgan, J.P., 2006. Carbon trading under the Kyoto protocol: Risks and opportunities for investors. Fordham Environmental Law Review, pp.151-184.

The Carbon Trading Exchange (CTX)

It offers several pivotal features essential to its operation.[65] Firstly, the settlement and clearing of funds and credits occur immediately, ensuring efficient transactions. Secondly, stringent security measures including full encryption are implemented, safeguarding the interests of all participants. Thirdly, real-time market information is made available to buyers, aiding in the comprehension of sales trends and project attributes. Lastly, buyers have the flexibility to engage in transactions using four major currencies - Euro, GBP, USD, and AUD, thereby enhancing accessibility and convenience within the exchange platform. The transaction can be conveniently described by the following illustration to understand better -

In addressing the challenge of aligning current emissions (X) with the prescribed emission quota (Y), a manufacturing company faces two primary options. Firstly, the company can invest in advanced machinery or technologies designed to reduce its emissions from X to Y tons. This approach involves capital expenditure on energy-efficient equipment or adopting innovative processes that inherently produce fewer emissions. For instance, a manufacturing firm emitting 1500 tons of carbon dioxide annually, which surpasses its emission quota of 1200 tons, may opt to acquire new energy-efficient machinery. This investment would enable the company to lower its emissions to 1100 tons, thus falling within regulatory limits.

Alternatively, the company may choose to purchase carbon credits equivalent to the excess emissions, which in this case is (X - Y) or 300 tons. Carbon credits represent a market-based mechanism allowing organizations to offset their emissions by investing in environmental projects that reduce carbon dioxide in the atmosphere.[66] By purchasing 300 carbon credits, the company can effectively balance its emissions to comply with the quota without immediate changes to its operational processes. This strategy provides a flexible and potentially less disruptive means of achieving regulatory compliance while supporting global emission reduction initiatives.

Both strategies offer distinct advantages: investing in technology fosters long-term sustainability and operational efficiency, whereas purchasing carbon credits provides immediate compliance

[65] Braccio, S., 2024. The market of carbon credits and biofuels (Doctoral dissertation, Politecnico di Torino).
[66] Verma, M., 2023. Navigating the World of Carbon Credits: Strategies for Emissions Reduction and Market Participation. Int. J. Trend Sci. Res. Dev, 7, pp.259-264.

with regulatory standards.[67] The choice between these options depends on the company's financial capacity, strategic goals, and commitment to environmental stewardship. Even though a single carbon credit is currently worth about USD 27, it is actually possible to purchase them for about USD 10 per CER. Therefore, even though the price of storing a tonne of carbon depends on the commodity or method utilized, it can cost between US$10 and $15 per tonne. It provides a 5 USD profit for each Carbon Credit, or CER. Under the assumption of economies of scale, this strategy becomes appealing to businesses, power plants, and consumers in order to satisfy their pledges to reduce pollution and become more environmentally friendly while also earning extra revenue or cutting expenses.

[67] Dhanda, K.K. and Hartman, L.P., 2011. The ethics of carbon neutrality: A critical examination of voluntary carbon offset providers. Journal of Business Ethics, 100, pp.119-149.

CHAPTER 3:
CARBON EMISSION TRADING AND INDIA
- A DETAILED ANALYSIS

Introduction

Climate change presents an imminent and serious challenge to humanity. Recent catastrophic events around the globe include devastating wildfires in California, Australia, and the Amazon rainforest, widespread flooding in Europe, Asia, and parts of the United States, severe droughts in South Africa, Australia, and parts of Asia, and cyclones causing extensive damage in the Caribbean, Southeast Asia, the Pacific Islands and cyclones worldwide, shifting agricultural patterns, and increasing species extinctions emphasize the broad impact of climate change on our lives. In anticipation of the catastrophic effects of climate change, most nations signed the Paris Agreement in December 2015. Currently, 195 out of 198 parties are signatories to the Agreement with a primary goal to limit the global temperature - increase to well below 2 degrees Celsius above pre-industrial levels, striving for a more ambitious target of 1.5 degrees Celsius. The Agreement mandates all parties to collectively commit to their best efforts through the 'intended nationally determined contributions' (INDCs). India's INDC for 2021 to 2030 outlines highly ambitious goals to adopt a cleaner, climate-friendly path by the end of the period.[68] These include reducing the emission intensity of its GDP by 33 to 35 percent from 2005 levels and achieving about 40 percent cumulative installed capacity of electric power from non-fossil fuel sources by 2030.[69] Additionally, the Indian government supports various measures to promote renewable energy. These include targeting 100 gigawatts of solar capacity by 2022 under the 'National Solar Mission',[70] increasing the Renewable Portfolio Obligation, raising the coal tax, and requiring new coal power plants to incorporate at least 10 percent renewable energy capacity. Furthermore, initiatives like the Perform, Achieve and Trade (PAT) Mechanism incentivize energy-intensive units to improve energy efficiency targets of which we shall discuss further down the lane. The

[68] Styczynski, A.B., 2024. India's Energy (R) evolution. In India's Energy Revolution (pp. 1-14). Routledge India.
[69] GOVERNMENT OF INDIA, MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, LOK SABHAUNSTARRED QUESTION NO. 2344 https://sansad.in/getFile/loksabhaquestions/annex/177/AU2344.pdf?source=pqals#:~:text=Subsequently%2C%20under%20the%20Paris%20Agreement,40%25%20cumulative%20electric%20power%20installed
[70] Chowdhury, S.A., 2020. National Solar Energy Roadmap, 2021–2041. Sustainable and Renewable Energy Development Authority (SREDA).

transport sector is also undergoing regulatory improvements with plans to leap to Bharat Stage VI (BS VI) standards, aligning vehicle emissions with European norms.[71]

While these measures are sector-specific and have their limitations, there is a pressing need for a comprehensive nationwide mechanism. The various studies suggest that one of the most effective and economical approaches to mitigating emissions and mitigating climate change impacts involves implementing a comprehensive market-based strategy that assigns a price to carbon.[72] India's current efforts to combat climate change are viewed as fragmented and insufficient, prompting a call for a more comprehensive approach through the adoption of an emissions trading scheme (ETS)[73]. ETS is a widely accepted market-based mechanism where emitters are capped and allowed to trade carbon allowances. To effectively implement ETS in India, it is imperative that we establish an independent regulatory authority governing the same. This authority would play a crucial role in market facilitation, technical consultation, and contingency planning.[74] It would also make decisions on the inclusion of carbon-intensive industries, while granting state governments the authority over other industries based on specific emission profiles and economic impacts. To ensure the scheme's sustainability amidst price volatility, proposed measures must include safety valve triggers, a price-based market stability reserve (MSR), and allowance banking.[75] These elements are designed to integrate India into global climate efforts and provide a robust framework for efficiently achieving emission reduction targets.[76] In essence, India must adopt an emissions trading scheme and set up an independent regulatory authority[77] to implement a comprehensive approach and join the global mission to combat climate change.

The Carbon Credit Trading Scheme (CCTS) in India, administered by the Ministry of Power, was introduced on June 28, 2023, as part of a broader initiative to develop a comprehensive Indian Carbon Market (ICM). This initiative represents a transition from existing mechanisms for energy

[71] India Bharat Stage VI emission standards - International Council on Clean Transportation. (2021, November 24). International Council on Clean Transportation. https://theicct.org/publication/india-bharat-stage-vi-emission-standards/ last accessed 26 November 2023

[72] Moreno, R.A., Baron, R., Bohm, P., Chandler, W., Cole, V., Davidson, O., Dutt, G., Haites, E., Ishitani, H., Kruger, D. and Levine, M., 1996. Technologies, policies, and measures for mitigating climate change. Intergovernmental Panel on Climate Change.

[73] Chateau, J., Dang, G., MacDonald, M.M., Spray, J.A. and Thube, S.D., 2023. A Framework for Climate Change Mitigation in India. International Monetary Fund.

[74] Johnson, B., 2023. An assessment of clean development mechanism projects in the energy sector in India (Doctoral dissertation, Department of Commerce and Management Studies, University of Calicut).

[75] Knopf, B., Koch, N., Grosjean, G., Fuss, S., Flachsland, C., Pahle, M., Jakob, M. and Edenhofer, O., 2014. The European Emissions Trading System (EU ETS): ex-post analysis, the market stability reserve and options for a comprehensive reform.

[76] Janghu, S. and Rosencranz, A., 2018. Fighting India's war on carbon with an emissions trading program. Nat'l LU Delhi Stud. LJ, 5.

[77] Sarkar, A.N. and Dash, S., 2011. Emissions trading and carbon credit accounting for sustainable energy development with focus on India. Asia Pacific Business Review, 7(1)

efficiency and renewable energy certificates to a more integrated domestic carbon market.[78] The primary objective of the CCTS is to encourage industries to reduce their carbon emissions through a market-based approach. Key institutions involved in the administration of the CCTS include the National Steering Committee for Indian Carbon Market, the Bureau of Energy Efficiency (BEE), the Grid Controller of India, and the Central Electricity Regulatory Commission (CERC). The National Steering Committee oversees the overall functioning of the Indian carbon market and makes recommendations to the BEE regarding the development of regulations and processes for the carbon market.[79] The BEE is tasked with identifying industries with the highest potential for reducing greenhouse gas emissions, establishing targets and compliance trajectories, distributing carbon credit certificates (CCCs), and setting criteria for achieving CCCs within each industry. The Grid Controller of India acts as the registry for the Indian carbon market, maintaining a database of registered CCC-related organizations, tracking CCC transactions, and assisting in the development of an information technology platform for managing CCC data. The CERC regulates trading activities within the Indian carbon market, including the frequency of CCC trading and market monitoring to prevent fraud and ensure market integrity.[80] The governance structure of the CCTS involves several key responsibilities distributed among the aforementioned institutions. The National Steering Committee ensures the overall functioning of the market, while the BEE administers the scheme, sets targets, and distributes CCCs. The Grid Controller of India maintains the registry and tracks transactions, and the CERC regulates trading activities. The timeline for the implementation of the CCTS began on June 28, 2023, with the publication of a notice in the Gazette of India by the Ministry of Power. The Government of India aims to fully roll out the Carbon Credit Trading Scheme by 2026. Looking ahead, several challenges and future directions need to be addressed to ensure the success of the CCTS.[81] Ensuring transparency and market integrity is vital, as is aligning the scheme with India's Nationally Determined Contributions (NDC) goals and global climate standards for international recognition. Furthermore, there is a need to extend the scheme's scope to cover additional sectors and activities, including agriculture, forestry, and land use, transportation, airlines, waste management, and carbon capture and storage. In conclusion, the Carbon Credit Trading Scheme in India represents a significant step towards achieving net-zero carbon emissions. By incentivizing industries to adopt environmentally friendly practices through market mechanisms, the scheme aims to facilitate a shift towards cleaner and more sustainable operations.[82] Despite the challenges that persist, proactive measures,

[78] Rrma. (2023, August 30). *India Introduces a Trading System for Carbon Credits*. Indian Chemical Regulation Helpdesk. https://indianchemicalregulation.com/india-introduces-a-trading-system-for-carbon-credits/ last accessed 16 June 2024

[79] Lal, H. (2023, August 10). Carbon Credit Trading Scheme —India's bold step towards net zero. *CNBCTV18*. https://www.cnbctv18.com/views/carbon-credit-trading-scheme-17473261.htm last accessed 17 June 2024

[80] ibid

[81] Bhatt, N. (2024, April 4). India's proposed carbon credit trading scheme: What it is, why it matters and what to expect. *Business Today*. https://www.businesstoday.in/opinion/columns/story/indias-proposed-carbon-credit-trading-scheme-what-it-is-why-it-matters-and-what-to-expect-424307-2024-04-04 last accessed 17 June 2024

[82] *Earthood | Changing world's Climattude*. (n.d.). https://www.earthood.in/zoomed-out-carbon-credit-trading-scheme-indias-bold-step-towards-net-zero last accessed 17 June 2024

transparency, and collaboration among ministries and stakeholders promise a greener and climate-resilient future for India. Looking back, due to challenges in monitoring and mitigating air pollution using traditional enforcement techniques, the Union Ministry of Environment and Forests (MoEF) implemented a market-based system back in 2011 as a trial project to lower air pollution.[83] The Emissions Trading Scheme is what is known as the (ETS). The world's first ETS specifically designed for "particulate matter" is what is being suggested here.[84] To improve overall ambient air quality, the ministry launched the pilot in industrial areas of three states: Tamil Nadu, Maharashtra, and Gujarat. The plan was still in its early stages, and the outcomes of the pilots were to be evaluated to assess if it can be implemented in other regions of the nation.[85]

A Continuous Emission Monitoring (CEM) system incorporated into the policy to achieve the desired results and efficiency was considered with much high regard.[86] A CEM to understand better, is a system composed of several critical subsystems: the sampling interface, gas analyzers, and the data acquisition/controller system. The sampling interface is responsible for either transporting or separating flue gas for the analyzer.[87] CEM systems are distinguished based on the design of this interface. In extractive systems, the interface extracts and conditions the gas before it reaches the analyzer. Speaking with more technicality, in-situ systems, the interface is simpler, consisting of flanges that align or support the monitor and blower systems to reduce interference from particulate matter. The data acquisition/controller subsystem is essential for the overall system's operation. It manages automatic functions such as calibration, probe purging, and alarming.[88] The data acquisition system receives analyzer data, converts it into appropriate units, records it, and generates reports for both internal and external use. Modern CEM data acquisition systems are often networked to engineering, corporate, and regulatory offices, where the data are utilized for various operational and management purposes. Both extractive and in-situ systems must operate continuously in the source environment, adapting to changing stack and ambient conditions.

While well-designed and maintained systems typically handle these challenges, alternative approaches have also been explored in India. One such approach, remote sensing, has seen limited success and has not been widely adopted.[89] Another alternative, correlating stack emissions to process parameter data, has led to the development of computerized "predictive emission

[83] National Clean Air Program (NCAP) to improve air quality in 131 cities by engaging all stakeholders. (n.d.). https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1909910

[84] Bandyopadhyay, K.R., 2016. Emission trading in India: A study of two schemes. AGI Working Paper Series, 2016, pp.1-44.

[85] Bandyopadhyay, K.R., 2016. Emission trading in India: A study of two schemes. AGI Working Paper Series, 2016, pp.1-44.

[86] Zhang, X. and Schreifels, J., 2011. Continuous emission monitoring systems at power plants in China: Improving SO2 emission measurement. Energy Policy, 39(11), pp.7432-7438.

[87] Jahnke, J.A., 2022. Continuous emission monitoring. John Wiley & Sons.

[88] Zheng, H. and Tang, G., 2008, July. Developing data acquisition and handling system for continuous emission monitoring system from coal-fired power plant. In 2008 Chinese Control and Decision Conference (pp. 3616-3619). IEEE.

[89] Navalgund, R.R., Jayaraman, V. and Roy, P.S., 2007. Remote sensing applications: An overview. current science.

monitoring systems" (PEMS). PEMS have been successfully employed in various applications and show significant potential, especially when used alongside extractive or in-situ monitoring hardware.[90] The installation of Continuous Emission Monitoring Systems (CEMS) can be costly for industries, even though they provide accurate monitoring for a variety of pollutants. CEMS can be utilized in numerous sectors, including power, steel, cement, chemical fertilizers, petrochemicals, pharmaceuticals, boilers, incinerators, and paper.[91] A critical issue during the implementation of CEMS is the need for a standardized guideline with specifications for calibrating different types of CEMS and comparing results from various imported equipment to ensure consistency and uniformity.[92] To address this, the Tamil Nadu Pollution Control Board had initiated the development and standardization of a basic platform to eliminate disparities in results.[93]

The scheme empowers central and state pollution control boards to establish a 'cap' on the total allowable pollution within an industrial area, thereby enabling industries to self-regulate to ensure compliance within this limit.[94] Industries that exceed their emission allowances can purchase permits from those that surpass their reduction targets, similar to the carbon trading system.[95] Although the regulators determine the overall emission cap, they do not dictate the specific emissions of individual sources.[96] Consequently, industries incur costs for their emissions and can engage in buying and selling permits within the established cap.[97] This pricing mechanism makes pollution expensive, providing an incentive for industries to reduce emissions.[98] Industries are granted the flexibility to devise their own compliance strategies, either through adopting abatement processes, implementing technological changes, or participating in permit trading.[99] This flexibility allows units with lower reduction costs to emit less and sell their emission rights to other units, thereby reducing overall compliance costs.[100] Auctioning is proposed as the preferred method for allocating permits, as it underscores the government's commitment to establishing an

[90] Jahnke, J.A., 2022. Continuous emission monitoring. John Wiley & Sons.
[91] Srivastava, R.P., Kumar, S. and Tiwari, A., 2024. Continuous emission monitoring systems (CEMS) in India: Performance evaluation, policy gaps and financial implications for effective air pollution control. Journal of Environmental Management, 359, p.120584.
[92] ibid
[93] Bandyopadhyay, K.R., 2016. Emission trading in India: A study of two schemes. AGI Working Paper Series, 2016, pp.1-44.
[94] Gulati, M., 2011. Improving Environmental Compliance through Mandatory Disclosure–A Home Grown Model for Indian SMEs. accessed on.
[95] Liu, L., Chen, C., Zhao, Y. and Zhao, E., 2015. China′ s carbon-emissions trading: Overview, challenges and future. Renewable and Sustainable Energy Reviews, 49.
[96] Betsill, M. and Hoffmann, M.J., 2011. The contours of "cap and trade": the evolution of emissions trading systems for greenhouse gases. Review of Policy Research, 28(1), pp.83-106.
[97] Narassimhan, E., Gallagher, K.S., Koester, S. and Alejo, J.R., 2018. Carbon pricing in practice: A review of existing emissions trading systems. Climate Policy, 18(8), pp.967-991.
[98] ibid
[99] Shen, W., 2015. Chinese business at the dawn of its domestic emissions trading scheme: incentives and barriers to participation in carbon trading. Climate Policy, 15(3), pp.339-354.
[100] Perdan, S. and Azapagic, A., 2011. Carbon trading: Current schemes and future developments. Energy policy, 39(10), pp.6040-6054.

emission rights framework and sends clear price signals to participating units from the onset of the scheme.[101]

A notable complication in linking the National Ambient Air Quality Standards (NAAQS) and ambient air quality to the emission cap is that NAAQS pertains to the total pollutant levels in an area,[102] influenced by all local sources (with industry being just one fraction) and distant sources whose pollutants are transported by meteorological forces.[103] Therefore, a more straightforward approach is to estimate the current contribution of industries covered by the pilot scheme and set a target below that level.[104] The pilot emissions trading scheme thus can be seen as a collaborative effort involving multiple stakeholders.[105]

In India, the scheme is overseen by the Ministry of Environment & Forests (MoEF), Government of India alongside The Central Pollution Control Board (CPCB) providing technical advice for the implementation of the scheme.[106] The respective State Pollution Control Boards (SPCBs) of Gujarat, Maharashtra, and Tamil Nadu are responsible for implementing the scheme, both directly and indirectly, often working through private consulting firms with expertise in relevant technical and financial fields.[107] J-PAL (Abdul Latif Jameel Poverty Action Lab) South Asia at the Institute of Financial Management and Research (IFMR) also serves as an independent advisor and evaluator for the scheme to enhance the initiative from all aspects.[108] To ensure proper development and implementation, a governing council was formed within MoEF and further this council has been scheduled to meet approximately three times per year during the first two years of the scheme and in regular formats thereafter to keep the council and related affairs updated.

[101] Munro, J., 2018. Emissions trading schemes under international economic law. Oxford University Press.
[102] Esworthy, R., 2008. Particulate Matter (PM2. 5): Implementation of the 1997 National Ambient Air Quality Standards (NAAQS). Congressional Research Service.
[103] Erbes, R.E., 1996. A practical guide to air quality compliance. John Wiley & Sons.
[104] Atteridge, A., Nilsson Axberg, G., Goel, N., Kumar, A., Lazarus, M., Ostwald, M., Polycarp, C., Tollefsen, P., Torvanger, A., Upadhyaya, P. and Zetterberg, L., 2009. Reducing Greenhouse Gas Emissions in India. Financial mechanisms and opportunities for EU-India collaboration.
[105] Sarkar, A.N. and Dash, S., 2011. Emissions trading and carbon credit accounting for sustainable energy development with focus on India. Asia Pacific Business Review, 7(1), pp.50-80.
[106] Chungyalpa, W., 2020. Examination and analysis of the central pollution control board and the state pollution control board-indian administrative arm for environmental protection. Indian Journal of Sustainable Development, 6(1).
[107] Srivastava, R.P., Kumar, S. and Tiwari, A., 2024. Continuous emission monitoring systems (CEMS) in India: Performance evaluation, policy gaps and financial implications for effective air pollution control. Journal of Environmental Management, 359.
[108] Bandyopadhyay, K.R., 2016. Emission trading in India: A study of two schemes. AGI Working Paper Series, 2016.

Synergizing Energy Efficiency and Carbon Emission Trading: The Role of PAT in India's NMEEE

Given the critical role that energy efficiency can play in ensuring energy security and future CO2 reduction, the National Mission for Enhanced Energy Efficiency (NMEEE) has been established as a key mission among the eight national missions[109] of the National Action Plan on Climate Change (NAPCC). This mission aims to promote innovative policy and regulatory frameworks, financing mechanisms, and business models that facilitate the creation and sustainability of markets for energy efficiency, with clearly defined deliverables to be achieved in a transparent and timely manner. The Bureau of Energy Efficiency (BEE), under the Ministry of Power, is responsible for the implementation of this mission. NMEEE comprises four new initiatives, one of which is the Perform, Achieve and Trade (PAT) scheme.[110] PAT is a market-based mechanism designed to enhance the cost-effectiveness of energy efficiency improvements in large, energy-intensive industries and facilities by certifying energy savings that can be traded.[111] The PAT scheme is essentially a market-based tool that mirrors a cap-and-trade mechanism. It aims to improve the cost-effectiveness of energy efficiency enhancements in large, energy-intensive industries and facilities.[112] This is achieved through the issuance and trading of energy saving certificates (ESCerts) between units that surpass energy efficiency targets and those that do not, within designated energy-intensive industries. The ESCerts will be traded on platforms created by the Power Exchange India Limited (PXIL) and the Indian Energy Exchange (IEX).[113]

With the introduction of the PAT scheme, India became the first developing country to implement a market-based mechanism centered on trading energy saving certificates.[114] This program not only promotes the scaling up of energy efficiency in key industries but also supports increased production and energy consumption necessary for growth. By aligning with carbon emission trading principles, the PAT scheme highlights India's commitment to innovative solutions for reducing carbon emissions while fostering economic development. The PAT scheme is rooted in the Energy Conservation Act (ECA) of 2001. The ECA provides the legal framework, institutional

[109] Gupta, M. and Sengupta, R., 2012. Fiscal & Monetary Policy aspects under Framework for Energy Efficient Economic Development (FEED) Mechanism of National Mission for Enhanced Energy Efficiency (NMEEE). Journal of Economic Policy & Research, 14(1).
[110] CO_GEN, N.G.B., 2007. Bureau of energy efficiency.
[111] Oak, H. and Bansal, S., 2022. Enhancing energy efficiency of Indian industries: Effectiveness of PAT scheme. Energy Economics, 113.
[112] Friedman, B., 2009. Considerations for emerging markets for energy savings certificates.
[113] Ahmad, F. and Alam, M.S., 2019. Assessment of power exchange-based electricity market in India. Energy Strategy Reviews, 23.
[114] Sarangi, G.K. and Taghizadeh-Hesary, F., 2021. Market-led energy efficiency transformation in India: A deep dive into the perform, achieve, trade (PAT) scheme. Energy Efficiency Financing and Market-Based Instruments, pp.223-242.

setup, and regulatory mechanisms necessary to launch energy efficiency services across India.[115] It also led to the establishment of the Bureau of Energy Efficiency by the Ministry of Power in 2002, which was tasked with developing national policies and providing direction for energy efficiency initiatives, including advisory services. The ECA grants the Indian Government the authority to identify energy-intensive industries as Designated Consumers (DCs) and set mandatory energy conservation or savings targets for them.[116] These Designated Consumers, as specified under the ECA, represent 25% of the national gross domestic product (GDP) and approximately 45% of commercial energy consumption in India.[117]

According to Section 14(g) of the Energy Conservation Act, 2001,[118] the central government has the authority to set energy usage norms for designated consumers.[119] To establish these norms, the BEE conducted sector-specific studies. These studies revealed significant variations in specific energy consumption (SEC) within different industrial sectors. In fact, the lower the specific energy consumption (SEC), meaning higher energy efficiency, the lower the potential for additional energy savings.[120] The lack of uniformity in SEC within a sector results in a lack of homogeneity, making it challenging to establish a single benchmark SEC for the entire sector.[121]

It is crucial to evaluate the performance of the carbon market in India as a tool for promoting mitigation efforts. India's carbon market is primarily composed of Clean Development Mechanism (CDM) projects registered with the CDM Executive Board (CDM-EB), along with a few scattered voluntary carbon reduction projects.[122] The CDM has been notably successful in attracting investment for sustainable projects in India. Currently, India is the second-largest supplier of Certified Emission Reductions (CERs) globally, following China.[123] A study by the New Climate Institute estimated the potential supply of CERs from projects registered under India's Clean Development Mechanism (CDM) from 2013-2020 at 4.7 billion CERs.[124] Additionally, India has

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[115] Roy, J., Dasgupta, S., Ghosh, D., Das, N., Chakravarty, D., Chakraborty, D. and De, S., 2018. Governing National Actions for Global Climate Change Stabilization: Examples from India 1. In Climate Change Governance and Adaptation (pp. 137-159). CRC Press.

[116] Sharma, P., Sharma, A., Leiva, V., Cabezas, X. and Martin-Barreiro, C., 2023. Assessment of profitability and efficiency of regulatory acts on energy-intensive industries: a panel data methodology and case study in India. Stochastic Environmental Research and Risk Assessment, 37(12).

[117] Iyer, M. and Sathaye, J., 2012. Market assessment of public sector energy efficiency potential in India.

[118] Energy Conservation Act, 2001 - Section 14(g)
"establish and prescribe such energy consumption norms and standards for designated consumers as it may consider necessary"

[119] Bhattacharya, T. and Kapoor, R., 2012. Energy saving instrument–ESCerts in India. Renewable and sustainable energy reviews, 16(2).

[120] Greening, L.A., Greene, D.L. and Difiglio, C., 2000. Energy efficiency and consumption—the rebound effect—a survey. Energy policy, 28(6-7).

[121] Pearson, T.C. and Pearson, J.L., 2007. Protecting global financial market stability and integrity: Strengthening SEC regulation of hedge funds. NCJ Int'l L. & Com. Reg., 33, p.1.

[122] Johnson, B., 2023. An assessment of clean development mechanism projects in the energy sector in India (Doctoral dissertation, Department of Commerce and Management Studies, University of Calicut).

[123] Nair, S. and Nandakumar, P., 2013. Environmental carbon trading scenario in India: a global issue of 21st century: a review. Int J Adv Res Technol, 2(9), pp.110-118.

[124] Hub, I. S. K. (n.d.). Carbon Pricing and Markets Update: CDM CERs listed on Carbon Trade eXchange | News | SDG Knowledge Hub | IISD. https://sdg.iisd.org/news/carbon-pricing-and-markets-update-cdm-cers-listed-on-carbon-trade-exchange/ (09 June 2024-last accessed)

the second-highest number of projects registered with CDM-EB,[125] with 509 out of a total of 2,238 projects worldwide (UNFCCC, 2010b). India has been recognized for its substantial role in the carbon market. For instance, with its new Nationally Determined Contribution announcement, India is projected to occupy 9% of the remaining IPCC 400 Gt carbon budget for 1.5°C by 2030.[126] The primary CDM projects in India include wind, biomass, hydro, and energy efficiency initiatives. Several key factors have contributed to the success of CDM in India, including the government's readiness to implement CDM, increased awareness of climate change, financial benefits for industries, and interest from academia.[127] The programmatic CDM (pCDM), which adopts a programmatic approach rather than a project-based one, is also gaining traction, with one of the three registered programs of activities originating from India.[128]

Despite the success of CDM in India, several challenges persist in the carbon markets. These include difficulties in generating large-scale projects, particularly in renewables and energy efficiency, limited instances of technology transfer from Annex I countries (Seres and Haites, 2008), the inability of small and medium enterprises (SMEs) to benefit from CDM, the bureaucratic nature of the CDM process causing delays in approvals, and a lack of clarity regarding price expectations.[129] Although the global carbon market grew by 6% to reach US$144 billion in 2009, the share represented by CDM has significantly decreased.[130] The CDM market declined by 59%, dropping to an estimated US$2.7 billion in 2009 (reports taken from Kossoy and Ambrosi, 2010).[131] It is essential to understand the interaction between CDM and other schemes, such as the proposed Perform, Achieve, and Trade (PAT) scheme by the Bureau of Energy Efficiency (BEE), and their impact on the feasibility of establishing an Emission Trading System (ETS) in India. Issues like double accounting and price impacts are significant concerns.[132] As noted, India played a significant role in the Clean Development Mechanism (CDM) and emerged as the world's second largest generator of Certified Emission Reductions (CERs). Several Indian CERs were generated from projects focused on renewable energy, energy efficiency, industrial gasses, fuel switching, municipal solid waste, and forestry. The private sector led the development of about 85–90 percent

[125] Castro, P. and Michaelowa, A., 2008. Empirical analysis of performance of CDM projects. Climate Strategies Report, University of Zurich, 2(8).
[126] India's new climate targets: Bold, ambitious and a challenge for the world. (n.d.). https://www.downtoearth.org.in/blog/climate-change/india-s-new-climate-targets-bold-ambitious-and-a-challenge-for-the-world-80022 (last accessed - 09 June 2024)
[127] Yuvaraj Dinesh Babu, N. and Michaelowa, A., 2003. Removing barriers for renewable energy CDM projects in India and building capacity at the state level (No. 237). HWWA-Report.
[128] Ward, M., Streck, C., Winkler, H., Jung, M., Hagemann, M., Höhne, N. and O'Sullivan, R., 2008. The role of sector no-lose targets in scaling up finance for climate change mitigation activities in developing countries.
[129] Naus, J., The Clean Development Mechanism (CDM).
[130] Bréchet, T., Ménière, Y. and Picard, P., 2012. The clean development mechanism in a global carbon market. CORE Discussion Papers, 2040.
[131] Dehm, J., 2011. Tricks of Perception and Perspective: The Disappearance of Law and Politics in Carbon Markets: Reading Alexandre Kossoy and Phillippe Ambrosi, State and Tends of the Carbon Market 2010. Macquarie J. Int'l & Comp. Envtl. L., 7.
[132] Upadhyaya, P., 2020. Is emission trading a possible policy option for India? In Putting a Price on Carbon in South Africa and Other Developing Countries.

of these projects.[133] The CDM particularly facilitated the early adoption of large-scale renewable energy[134] technologies such as solar, wind, small hydro, and biomass.[135] Recent discussions have highlighted that India's future carbon credits from mature technologies will not be eligible for international trade until the country meets its Nationally Determined Contributions (NDCs).[136] This development has garnered attention and raised concerns among external observers.

Feasibility Of Emission Trading System in India

The feasibility of an Emission Trading System (ETS) in developing countries has received limited attention in existing research. This is likely due to the initial interpretation of the Kyoto Protocol, which envisioned ETS primarily for industrialized countries,[137] with developing nations participating through the Clean Development Mechanism (CDM). Only recently has ETS emerged as a potential policy option for developing countries. An earlier study indicated that the 'Indian situation is amenable to implementation of well-designed market-based incentives' (Gupta, 2002).[138] However, international emissions trading can potentially reduce welfare when distortions exist, particularly for sellers whose gains from emissions trading are less than the efficiency costs due to pre-existing distortionary taxes (Babiker et al., 2002).[139] Since this study, significant developments have occurred both in India's domestic policy landscape and in international climate negotiations. Consequently, it is now pertinent to reassess whether the Indian context is favorable for implementing an ETS. The feasibility of an ETS in India is considered from two perspectives:

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[133] Unnikrishnan, S. and Singh, A., 2010. Energy recovery in solid waste management through CDM in India and other countries. Resources, Conservation and Recycling, 54(10), pp.630-640.

[134] https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html. Last accessed 10 June 2024

[135] Van der Gaast, W., Begg, K. and Flamos, A., 2009. Promoting sustainable energy technology transfers to developing countries through the CDM. Applied Energy, 86(2), pp.230-236.

[136] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216 accessed 2 June 2024

[137] Aldy, J.E. and Stavins, R.N., 2008. Climate policy architectures for the post-Kyoto world. Environment: Science and Policy for Sustainable Development, 50(3).

[138] Gupta, S., 2002. Incentive-based approaches for mitigating greenhouse gas emissions: issues and prospects for India. Pg no. 17

Quoted - "Many of these countries have (or had until recently), problems similar to those that are cited in the Indian context against the use of MBIs: imperfectly functioning markets, problems of monitoring and enforcing standards (due to a bloated and inefficient bureaucracy, shortage of resources, large number of micro and small-scale firms), and so on. While these difficulties are real and cannot be ignored, i*t is also true that the Indian situation is amenable to the implementation of well-designed MBIs."*

[139] Babiker, M., Reilly, J. and Viguier, L., 2004. Is international emissions trading always beneficial? The Energy Journal, 25(2). Pg no. 53

"It occurs in countries exporting emission permits when efficiency costs associated with pre-existing distortionary taxes are larger than the primary gains from emission trading.

The case can arise because (1) energy markets are already highly distorted in the European Union, and (2) EU countries are heavily dependent on trade. It means that the tax-interaction effect and the drop in the terms of trade can be great enough to offset the direct income gains from emissions trading."

political and institutional.[140] The current state of carbon credits trading practices within the manufacturing sector reveals a nuanced landscape with both positive and negative implications. Carbon credits, a key component of market-based environmental policies, allow companies to purchase the right to emit a certain amount of carbon dioxide or other greenhouse gases, thereby creating a financial incentive to reduce emissions. This system is designed to provide flexibility in how companies meet their emissions reduction targets, fostering a more cost-effective approach to environmental regulation.

One of the primary positive impacts of carbon credits trading is the financial incentive it provides for reducing emissions.[141] By allowing companies and even the agricultural sector to monetize their surplus reductions, carbon credits create a tangible economic benefit for implementing greener technologies[142] and processes.[143] This market-based approach encourages innovation, as companies seek cost-effective ways to lower their emissions and sell excess credits. The revenue generated from selling credits can then be reinvested into further emissions-reducing technologies, creating a virtuous cycle of improvement and sustainability within the manufacturing sector. Furthermore, carbon credits trading supports regulatory compliance.[144] Companies that find it challenging to reduce their emissions quickly enough to meet regulatory standards can purchase credits to offset their excess emissions. This flexibility is particularly beneficial for industries where immediate emissions reductions are technologically or economically unfeasible. By providing a mechanism to bridge the gap between current capabilities and regulatory requirements, carbon credits trading helps ensure that environmental standards are met without causing undue financial strain on businesses.[145] However, the carbon credits market is not without its drawbacks. One significant negative impact is market volatility.[146] The price of carbon credits can fluctuate widely due to changes in regulatory policies, market demand, and speculative activities. This volatility makes it difficult for companies to plan their long-term investments and operational strategies, introducing a level of financial uncertainty that can be detrimental to stable business

[140] Upadhyaya, P., 2020. Is emission trading a possible policy option for India? In Putting a Price on Carbon in South Africa and Other Developing Countries.

[141] Sarkar, A.N. and Dash, S., 2011. Emissions trading and carbon credit accounting for sustainable energy development with focus on India. Asia Pacific Business Review, 7(1), pp.50-80.

[142] Dwivedi, P. (2023, March 9). How Indian farmers can benefit from carbon credits. ETEnergyworld.com. https://energy.economictimes.indiatimes.com/blog/how-indian-farmers-can-benefit-from-carbon-credits/98513122 (accessed last 14 May 2024)
Quoted - "Farmers adopting sustainable farming practices, in the long run, are not only benefitting from the additional income they can generate via selling these carbon credits but also are improving their soil health, yield quality acreage and profitability."

[143] Guttmann, R. and Guttmann, R., 2018. Carbon Money. Eco-Capitalism: Carbon Money, Climate Finance, and Sustainable Development, pp.209-249.

[144] Perdan, S. and Azapagic, A., 2011. Carbon trading: Current schemes and future developments. Energy policy, 39(10).

[145] Wood, R.G., 2011. Carbon finance and pro-poor co-benefits: the gold standard and climate, community and biodiversity standards (Vol. 4). IIED.

[146] Dong, F., Li, Z., Cui, J., Zhang, Y., Lu, B., Fan, K., Xu, K., Li, J. and Sun, J., 2024. Analysis of market risk volatility and warning in carbon trading market. Journal of Cleaner Production, 452, p.142014.

operations.[147] Regarding this concern, it is crucial to address the issue of price stability within the carbon market. The volatility of allowance prices can have significant economic impacts and influence compliance behavior among emitters. Various mechanisms, such as safety valve triggers and market stability reserves (MSR), have been explored in other ETS models to mitigate price fluctuations and maintain a stable market.[148] Incorporating these strategies into India's ETS can help manage price volatility and encourage sustainable investment in low-carbon technologies.

Safety Valve Triggers - The introduction of a safety valve into an emission trading system has a significant impact on triggering firms' investment activity, notably increasing the allowance price threshold.[149] This escalation suggests potential deterrents to investments and likely delays in investment in subsequent periods. Sensitivity tests highlight the crucial role of safety valve prices in mechanism design, emphasizing that excessively low prices could entirely deter investment.[150] Conversely, higher safety valve prices are associated with a greater likelihood of investment. The stabilizing effect of safety valves on future allowance prices reduces the influence of other parameter variations, such as initial investment costs and interest rates. Additionally, a symmetric safety valve mechanism, incorporating upper and lower price limits, proves more effective in preserving environmental integrity.[151] Future research should focus on refining models with additional emission trading data, evaluating social welfare impacts, and exploring innovative mechanisms like an allowance reserve to enhance the efficacy of emission trading systems.[152]
The U.S. Regional Greenhouse Gas Initiative (RGGI) uses three such triggers. If the average price of allowances reaches $10 after 14 months, the compliance period can be extended up to three years, allowing emitters more time to balance their emissions. If the price hits $7 after 14 months for a year, emitters can offset allowances with projects from North America, increasing the offset limit to 5% of reported emissions. If the first trigger happens twice in consecutive years, emitters can use international offset credits, raising the offset limit to 10% of reported emissions.[153]

Market Stability Reserve - To prove the substance this mechanism holds; we may borrow the example of EU ETS. The European Commission has proposed a Market Stability Reserve (MSR) to address the surplus of allowances in the EU ETS.[154] By delaying the issuance of allowances

[147] Supra note 74
[148] Holt, C.A. and Shobe, W., 2015. Price and Quantity 'Collars' for Stabilizing Emissions Allowance Prices: An Experimental Analysis of the EU ETS Market Stability Reserve. Resources for the Future, pp.15-29.
[149] Burtraw, D., Palmer, K. and Kahn, D., 2010. A symmetric safety valve. Energy Policy, 38(9), pp.4921-4932.
[150] Maeda, A., 2012. Setting trigger prices in emissions permit markets equipped with a safety valve mechanism. Journal of Regulatory Economics, 41.
[151] Chen, C., 2013. Impact of a Safety Valve in an Emission Trading System: A Real Options Approach (Master's thesis, University of Waterloo).
[152] ibid
[153] Regional Greenhouse Gas Initiative - Memorandum of Understanding
[154] Αγιοστρατίτη, A., 2019. European Union Emissions Trading System (EU ETS) and its contribution to achieving the EU Targets on climate policy.

during periods of high surplus, the MSR aims to increase scarcity in the market earlier.[155] This mechanism is intended to stabilize allowance prices and create a more predictable pricing environment, thereby incentivizing firms to invest in low-carbon technologies.[156] By enhancing market efficiency and promoting long-term investment in emissions reduction, the MSR seeks to bolster the EU ETS's ability to achieve environmental objectives while maintaining emission levels within acceptable limits. The EU ETS includes a Market Stability Reserve (MSR) which releases 100 million allowances if market supply falls below 400 million. This automatic trigger aims to provide predictability and confidence for investors.[157] However, MSR has been criticized for causing more price instability. To address this, it has been suggested that MSR auctions should be based on price triggers rather than quantity triggers, making the process simpler, more transparent, and predictable.

Framework for India - As we try to decipher what might be best for us, it is better to be characterized by a combined approach using both safety valve triggers and price-based MSR that can stabilize prices within the Indian ETS. Safety valve triggers could address initial price increases by extending compliance periods or increasing offset credit limits. If prices continue to rise, a price-based MSR with clear rules could help manage prices and reduce instability. The RGGI uses a similar combination of mechanisms.[158] Another concern for India is the potential for inequality within the market. Larger companies with more substantial financial resources are better positioned to purchase the necessary credits, whereas smaller firms may struggle to afford them.[159] This disparity can create an uneven playing field, where financially stronger companies gain a competitive advantage not necessarily based on their environmental performance but on their ability to buy compliance.[160] This issue underscores the need for careful market regulation to ensure fairness and accessibility for all participants. Additionally, the practice of carbon credits trading can sometimes lead to greenwashing, where companies may rely on purchasing credits rather than making substantive changes to their operations.[161] This reliance on offsets can undermine the overall goal of emissions reduction, as it allows companies to maintain their current practices while appearing environmentally responsible. Ensuring that credits represent genuine

[155] Marcu, A., Olsen, J., Vangechten, D., Cabras, S., Mertens, T. and Caneill, J., 2021. The Review of the Market Stability Reserve (MSR). ERCST Roundtable Clim. Change Sustain. Transit. (Bloomb. NEF), 18.
[156] Gao, S. and Wang, C., 2021. How to design emission trading scheme to promote corporate low-carbon technological innovation: Evidence from China. Journal of Cleaner Production, 298.
[157] Perino, G., Willner, M., Quemin, S. and Pahle, M., 2022. The European Union emissions trading system market stability reserve: does it stabilize or destabilize the market? Review of Environmental Economics and Policy, 16(2), pp.338-345.
[158] Acworth, W., Schambil, K. and Bernstein, T., 2020. Market Stability Mechanisms in Emissions Trading Systems. ICAP. Berlin. https://icapcarbonaction.com/en accessed last 10 May 2024
[159] Mann, R.J., 1997. The role of secured credit in small-business lending. Geo. LJ, 86.
[160] Esty, D.C. and Winston, A., 2009. Green to gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage. John Wiley & Sons.
[161] Trouwloon, D., Streck, C., Chagas, T. and Martinus, G., 2023. Understanding the use of carbon credits by companies: A review of the defining elements of corporate climate claims. Global challenges, 7(4).

reductions in emissions is crucial to maintaining the integrity of the system.[162] Several factors influence the effectiveness and dynamics of carbon credits trading. Pollution levels directly impact the market, as higher emitters need more credits to offset their emissions.[163] This relationship creates a direct financial incentive for high-polluting industries to invest in cleaner technologies. Environmental regulations and laws of a nation also play a crucial role.[164] Stringent regulations increase the demand for carbon credits, driving market activity and encouraging reductions in emissions. Conversely, lenient regulations can dampen market demand, reducing the incentive for emissions reductions.[165]

As one confronts the question of feasibility in the case of carbon credits and carbon markets in a country like India, the geographical positioning is one to ponder deep into. However, the geographical location of an industry does not significantly affect carbon credits trading,[166] which simply implies that the geographical position of India has ultimately been close to interference with regard to carbon trading. This aspect suggests that the market operates within a framework where location-specific factors are less relevant, and the primary drivers are pollution levels and regulatory standards. Similarly, the economic status of a country or region does not directly influence carbon credits trading.[167] The market appears to be shaped more by regulatory and environmental considerations than by broader economic conditions. The level of industrial development or industrialization also does not significantly impact the trading of carbon credits, indicating that both developed and developing industrial sectors engage in the market in similar ways, focusing on emission levels and compliance with regulations rather than their overall development status.

Political Feasibility of ETS in India

India's current priorities are heavily influenced by the lack of basic amenities for a significant portion of its population.[168] Nearly one-third of Indians live on less than a dollar per day, and many remote areas still lack electricity.[169] Consequently, the government is primarily focused on

[162] Schwartzman, S., Lubowski, R.N., Pacala, S.W., Keohane, N.O., Kerr, S., Oppenheimer, M. and Hamburg, S.P., 2021. Environmental integrity of emissions reductions depends on scale and systemic changes, not sector of origin. Environ. Res. Lett, 16(9).

[163] Goulder, L.H., 2013. Markets for pollution allowances: what are the (new) lessons?. Journal of economic perspectives, 27(1), pp.87-102.

[164] Zhao, M., Liu, F., Song, Y. and Geng, J., 2020. Impact of Air pollution regulation and technological investment on sustainable development of the green economy in Eastern China: Empirical analysis with panel data approach. Sustainability, 12(8).

[165] Lin, P. and Pang, Y., 2020. Command-and-control regulation, incentive for pollution abatement, and market structure. Journal of Regulatory Economics.

[166] Perdan, S. and Azapagic, A., 2011. Carbon trading: Current schemes and future developments. Energy policy, 39(10), pp.6040-6054.

[167] Spash, C.L., 2010. The brave new world of carbon trading. New Political Economy, 15(2).

[168] Drèze, J. and Sen, A. eds., 1997. Indian development: Selected regional perspectives. Oxford University Press.

[169] Upadhyaya, P., 2020. Is emission trading a possible policy option for India? In Putting a Price on Carbon in South Africa and Other Developing Countries

maintaining high economic growth, ensuring electricity access for all, controlling inflation, and generating employment.[170] In international climate negotiations, India does not have an official position on ETS. However, India has consistently refused to accept mandatory emission reductions, arguing that developed countries, as the primary historical polluters, should bear the responsibility for financing mitigation and adaptation in developing nations.[171] Additionally, India opposes any form of sectoral emission reduction targets (MoEF, 2009b), indicating that the government is unlikely to impose caps on economy-wide or sector-wide emissions.[172] Implementing a cap-and-trade system involves setting an upper limit on emissions, allowing for a certain level of production and consumption beyond which society must bear additional costs. While companies can improve their emission intensity, enhancing efficiency in some sectors may be challenging, potentially impacting the growth rate of those sectors and, by extension, the overall economy.

Electricity in India is predominantly generated by thermal power plants using fossil fuels.[173] In recent years, electricity generation has resulted in nearly a 10% increase in emissions.[174] Given that this sector is the largest emitter, it would seem logical to include it in the ETS scope.[175] Additionally, companies have invested in capital-intensive technologies to improve efficiency, which adversely affected the employment rates. Implementing a cap-and-trade system potentially creates jobs elsewhere but might not effectively benefit those most affected, thereby complicating India's poverty reduction goals.[176] There is widespread reluctance among political parties in India to adopt specific emission reduction targets, which currently prevents consensus on implementing a cap-and-trade system in the near future.

Institutional Feasibility of ETS in India

Institutional feasibility refers to the societal "rules of the game" that govern human cooperation and behavior.[177] These institutions are essential as they establish both constraints, enforced through penalties, and incentives to encourage desired behaviors. Institutions can evolve over time to address human interaction challenges, operating in a path-dependent manner where new

[170] Peng, W., Kim, S.E., Purohit, P., Urpelainen, J. and Wagner, F., 2021. Incorporating political-feasibility concerns into the assessment of India's clean-air policies. One Earth, 4(8), pp.1163-1174.
[171] Heller, T.C. and Shukla, P.R., 2003. Development and climate: Engaging developing countries. Beyond Kyoto: Advancing the international effort against climate change.
[172] Fujiwara, N., 2010. The political economy of India's climate agenda. CEPS Working Documents, (325).
[173] Mittal, M.L., Sharma, C. and Singh, R., 2012, August. Estimates of emissions from coal fired thermal power plants in India. In 2012 International emission inventory conference (pp. 13-16).
[174] Supra note 168
[175] Verbruggen, A., Laes, E. and Woerdman, E., 2019. Anatomy of emissions trading systems: what is the EU ETS?. Environmental science & policy, 98.
[176] Paul, S., & Lal, K. (2020). Technology Intensity and Employment in the Indian Economy. Arthaniti, 20(1), 34–52. https://doi.org/10.1177/0976747919895326 accessed last 12 May 2024
[177] Greif, A. and Kingston, C., 2011. Institutions: rules or equilibria? In Political economy of institutions, democracy and voting (pp. 13-43). Berlin, Heidelberg: Springer Berlin Heidelberg.

institutions build upon existing ones. Therefore, any new system, such as emissions trading (ET), aimed at reducing emissions must integrate seamlessly with existing institutions without disrupting their functionality. Gupta (2002) suggests that India should consider implementing ET alongside other incentive-based policies like energy price reforms and carbon taxes, acknowledging the challenges and proposing solutions for market-based instruments (MBIs).[178]

In the Indian context, emissions trading should not conflict with existing mechanisms like the Clean Development Mechanism (CDM), the Perform Achieve and Trade (PAT) scheme under the National Mission for Enhanced Energy Efficiency (NMEEE),[179] and proposed mechanisms of Nationally Appropriate Mitigation Actions (NAMAs). PAT, for instance, sets targets for emission intensity but allows companies to maintain production levels, potentially leading to higher emissions. Conversely, ET imposes caps on emissions, encouraging reductions in CO2 emissions specifically. While the EU ETS covers energy-intensive industries, PAT in India encompasses similar sectors but operates differently.[180] This distinction raises concerns about potential overlap and double counting if both systems are applied concurrently. To avoid these issues, clear definitions of scope and coordination among monitoring bodies are crucial. However, the relationship between ETS and NAMAs requires further study to understand potential synergies or conflicts between these policy options.[181]

To sum up, while carbon credits trading offers a promising approach to managing industrial emissions and fostering innovation, it also presents challenges such as market volatility, potential inequality, and the risk of greenwashing.[182] The market's effectiveness hinges on robust regulatory frameworks and genuine efforts by industries to reduce emissions. Understanding these dynamics is essential for policymakers and industry leaders aiming to optimize the benefits of carbon credits trading and achieve meaningful environmental outcomes.[183]

[178] Gupta, S., 2002. Environmental benefits and cost savings through market-based instruments: an application using state-level data from India.
quoted - "Market-based instruments (MBIs) should be an integral part of any strategy to strengthen environmental management at the state level. In contrast to traditional regulatory approaches such as CAC, MBIs (as stated above) work through economic incentives to induce environmentally friendly behavior. By allowing flexibility in attaining environmental goals (such as reduction in emissions) MBIs offer potential cost savings. Thus, a given environmental target can be attained at less cost to society than through other regulatory approaches."
[179] Bandyopadhyay, K.R., 2016. Emission trading in India: A study of two schemes. AGI Working Paper Series, 2016.
[180] Pal, K., Mukhopadhyay, J.P. and Bhagawan, P., 2024. Does cap-and-trade scheme impact energy efficiency and firm value? Empirical evidence from India. Energy Economics.
[181] Hepburn, C., Grubb, M., Neuhoff, K., Matthes, F. and Tse, M., 2006. Auctioning of EU ETS phase II allowances: how and why? Climate Policy, 6(1), pp.137-160.
[182] Böhm, S., 2009. Upsetting the offset: the political economy of carbon markets. London: MayFlyBooks, 2009.
[183] Meckling, J., 2011. Carbon coalitions: Business, climate politics, and the rise of emissions trading. MIT Press.

Cap-and-Trade Systems and Kyoto Protocol Mechanisms: Implications for India's Policy Landscape

The Kyoto Protocol establishes a cap-and-trade system where each country had emissions targets for the period from 2008 to 2012.[184] Countries failing to meet their targets were made to compensate with their emissions reductions. Mechanisms like the Clean Development Mechanism (CDM) and Joint Implementation (JI) allow developed countries to finance emissions reduction projects in developing countries or within transition economies, generating Certified Emission Reductions (CERs). These credits must demonstrate additional and permanent emissions reductions. Beyond Kyoto, future agreements were expected to include international aviation and shipping. Following the Kyoto Protocol, international aviation and shipping sectors have adopted significant measures to reduce emissions. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) aims to stabilize aviation CO2 emissions at 2020 levels through carbon credits, while the International Civil Aviation Organization (ICAO) sets reduction targets. Similarly, the International Maritime Organization (IMO) has adopted strategies to cut shipping emissions, including a 40% carbon intensity reduction by 2030 and a net-zero target by 2050. The European Union has incorporated both sectors into its Emissions Trading Scheme (ETS). Despite these efforts, emissions from aviation and shipping are projected to grow significantly, with the IMO and ICAO striving for further reductions by 2050. In the re EU ETS Aviation Directive Case (2011) case,[185] the European Court of Justice upheld the inclusion of aviation in the EU Emissions Trading System, confirming the EU's authority to regulate GHG emissions from international aviation. Kyoto also allows groups of Annex I countries to form emission "bubbles," treated as single entities for compliance.[186] Numerous non-Kyoto carbon markets exist, such as the Regional Greenhouse Gas Initiative (RGGI) and initiatives in California and Oregon, suggesting a trend towards linked markets rather than a single carbon market.

In setting up a cap-and-trade program, decisions include which greenhouse gases and emission sources to cover, and who holds emission allowances. Sectors typically covered include electric power, manufacturing, transportation, and fossil-fuel based industries. Under such schemes, companies receive caps on CO2 emissions; those emitting less can sell surplus credits, while those exceeding their caps can purchase credits from others. Trading occurs through markets like Carbon Credit Exchanges or over-the-counter markets, where tradable units are allocated by regulators or produced through emission reduction projects. Ultimately, the crucial factor in mitigating dangerous climate change is not year-to-year emissions alone but the overall reduction trend in

[184] Aldy, J.E. and Stavins, R.N., 2013. Designing the post-Kyoto climate regime. In The quest for security: Protection without protectionism and the challenge of global governance (pp. 205-230). Columbia University Press.
[185] Aitken, C., & Perrin, C. (2012, March 8). *ECJ upholds the directive applying the EU ETS to aviation activities*. Lexology.https://www.lexology.com/library/detail.aspx?g=74ac0aed-405e-4ed7-b22b-bd89928e099b#:~:text=On%2021%20December%202011%20the%20European%20Court%20of,activities%20within%20the%20scope%20of%20the%20EU%20ETS Last accessed 20 June 2024
[186] Haites, E., 2001. 'Bubbling'and the Kyoto mechanisms. Climate Policy, 1(1)

emissions.[187] Emissions trading's effectiveness as a policy tool lies in its ability to contribute to achieving the desired environmental outcomes over the commitment period, even if it cannot directly attribute specific environmental improvements to its mechanisms. In a cap-and-trade system, the primary responsibility of policymakers and regulators is thus to establish and announce the emissions levels deemed necessary based on the latest scientific understanding to combat global warming effectively.[188]

Carbon Credit Accounting and Taxation Dynamics: Implications and Strategies for India

The emergence of revenue opportunities from structured Clean Development Mechanism (CDM) projects has significantly impacted the accounting and taxation of transacted carbon credits through exchanges and derivative markets. A carbon tax is an environmental tax aimed at reducing carbon dioxide and other greenhouse gas emissions, thereby mitigating climate change.[189] Unlike carbon cap-and-trade systems, which set limits on emissions and allow trading of permits, carbon taxes directly tax fossil fuels based on their carbon content. This approach is straightforward and can be popular if revenues are used to reduce other taxes or fund environmental projects. Carbon taxes are considered a price-based policy tool that increases the cost of goods and services with high carbon content, thereby reducing their demand ("price effect").[190] In contrast, tradable permits under cap-and-trade systems fix the total emissions allowed and allow prices to fluctuate based on market demand.[191] The trading of Certified Emission Reductions (CERs) has begun to yield significant foreign exchange earnings for Indian suppliers, prompting the Institute of Chartered Accountants of India (ICAI) to develop accounting standards for carbon credits[192]. For tax purposes, CERs are treated as capital assets. Tax liability is determined under Capital Gains, with concessional rates applicable if the credits are held for more than 36 months.[193] Timing the sale of

[187] Hansen, J., Kharecha, P., Sato, M., Masson-Delmotte, V., Ackerman, F., Beerling, D.J., Hearty, P.J., Hoegh-Guldberg, O., Hsu, S.L., Parmesan, C. and Rockstrom, J., 2013. Assessing "dangerous climate change": Required reduction of carbon emissions to protect young people, future generations and nature. PloS one, 8(12).

[188] Betsill, M. and Hoffmann, M.J., 2011. The contours of "cap and trade": the evolution of emissions trading systems for greenhouse gasses. Review of Policy Research, 28(1), pp.83-106.

[189] Li, W. and Jia, Z., 2017. Carbon tax, emission trading, or the mixed policy: which is the most effective strategy for climate change mitigation in China? Mitigation and Adaptation Strategies for Global Change, 22, pp.973-992.

[190] Karki, S., Mann, M.D. and Salehfar, H., 2006, March. Substitution and price effects of carbon tax on CO2 emissions reduction from distributed energy sources. In 2006 power systems conference: Advanced metering, protection, control, communication, and distributed resources.

[191] See Keohane, N.O., 2009. Cap and trade rehabilitated: Using tradable permits to control US greenhouse gases. Review of Environmental Economics and policy.

[192] *India: The hottest market for carbon trade? - India Business and Trade*. (2022, September 1). TPCI - Trade Promotion Council of India. https://www.indiabusinesstrade.in/blogs/india-the-hottest-market-for-carbon-trade last accessed 18 May 2024

[193] Soni, M. and Bhanawat, S.S., 2018. Accounting and taxation issues of carbon credit transactions. Pac. Bus. Rev. Int, 10(12), pp.41-50.

these credits involves considerations such as cash flow needs, interest rates, and tax differences between short-term and long-term holdings. Self-generated CER credits, without acquisition costs, are subject to Capital Gains Tax based on total sale consideration, categorized as long-term or short-term based on the holding period.[194] In Indian circumstances, the sale of CER credits to overseas buyers does not attract sales tax.

Carbon Credit Exchange Mechanisms: Strategic Potential and Implications for India

Exchanges play a crucial role in facilitating emissions trading while ensuring transaction reliability. Access to exchange operations is restricted to members who act as buyers or sellers. For trading carbon credits on exchanges like NYMEX, Paris Bourse, International Petroleum Exchange, or Sydney Futures Exchange, participation requires membership access.[195] Traders also incur fees per transaction, either fixed or percentage-based, which can be negotiated based on transaction volume. Higher trading volumes typically lower transaction costs. Exchanges monitor transactions to prevent price distortions and market manipulation, ensuring competitive fairness.[196]

Exchange-based trading operates through double auctions, where supply and demand for commodities meet on a centralized market, either electronically or physically. Transactions conclude when buyers and sellers agree on a price, promoting market transparency and competition.[197] Mumbai based MCX is a demutualized electronic multi-commodity futures exchange, facilitating online trading and settlement operations nationwide since November 2003.[198] MCX provides hedging opportunities against commodity price volatility, boasting significant market share and global credibility in commodities trading. Accredited with ISO 9001:2000 for quality management and ISO 27001:2005 for information security, MCX offers futures trading across 56 commodities, spanning bullion, energy, metals, agriculture, and more.[199] The exchange maintains strategic alliances globally, enhancing its role as a leader in commodity futures trading and technology innovation. Currently, carbon futures contracts are actively traded on European exchanges, where parties agree to buy or sell carbon credits at predetermined prices

[194] Sarkar, A.N. and Dash, S., 2011. Emissions trading and carbon credit accounting for sustainable energy development with focus on India. Asia Pacific Business Review, 7(1), pp.50-80.
[195] Sarkar, A.N., 2010. Global Climate Change, Emissions Trading and Sustainable Energy Development. Asia Pacific Business Review, 6(1), pp.42-66.
[196] Isser, S.N., 2016. A Review of Carbon Markets: EU-ETS, RGGI, California, the Clean Power Plan and the Paris Agreement. RGGI, California, the Clean Power Plan and the Paris Agreement (September 21, 2016).
[197] Marchant, G.E., Cooper, Z. and Gough-Stone, P.J., 2022. Bringing technological transparency to tenebrous markets: the case for using blockchain to validate carbon credit trading markets. Nat. Resources J., 62, p.159.
[198] Bhagwat, S., Maravi, A., Omre, R. and Chand, D., 2015. Commodity futures market in India: Development, regulation and current scenario. Journal of Business Management & Social Sciences Research, 4(2), pp.215-231.
[199] ibid

and times.[200] This market sees active participation from public utilities, manufacturing entities, brokers, banks, and others. Recognizing the potential in the European carbon credit market, the Multi Commodity Exchange of India Ltd. (MCX) formed a strategic alliance with the Chicago Climate Exchange (CCX) in September 2005 to launch carbon credit futures trading in India.[201] This initiative aimed to integrate Indian markets with global counterparts, mitigate risks associated with futures trading of carbon credits, and ensure competitive pricing. CDM projects, concentrated mainly in sectors like manufacturing, energy, agriculture, mining, and mineral production, are expected to bolster the Indian economy. Significant CDM projects are located in Rajasthan, Andhra Pradesh, Maharashtra, Karnataka, Himachal Pradesh, and Punjab.[202] Forecasts suggested that India's carbon credits trading could reach $100 billion by 2030. Additionally, the annual demand for voluntary carbon credits in India is expected to touch 500+ million units by 2030.[203] In 2007 alone, 160 new projects were registered with the UNFCCC, enabling Indian industries to generate over 27 million carbon credits. These projects receive additional support through investments and financing from developed nations, which act as potential buyers of Certified Emission Reductions (CERs).

[200] Perdan, S. and Azapagic, A., 2011. Carbon trading: Current schemes and future developments. Energy policy, 39(10), pp.6040-6054.

[201] Reporter, B. (2013, February 4). MCX launches carbon credit trading. www.business-standard.com. https://www.business-standard.com/article/markets/mcx-launches-carbon-credit-trading-108012201050_1.html

"The launch of carbon credits is significant as global warming has resulted in errant climate behavior and hence economic powers have started reducing carbon credit from the environment immediately. They have also started thinking seriously of reducing carbon dioxide emission. Consequently, more and more countries are adhering to global carbon emission norms," - Joseph Massey, deputy managing director, MCX.

"India is one amongst the global leaders having already generated close to 30 million carbon credits and has roughly another 140 million in the pipeline for sale, making it one of the largest beneficiaries in the carbon credit trade. The launch has provided a platform for Indian companies to be able to benefit from the adoption of cleaner technologies," - Joint Managing Director Lamon Rutten said.

Last accessed - 11 June 2024

[202] Johnson, B., 2023. *An assessment of clean development mechanism projects in the energy sector in India* (Doctoral dissertation, Department of Commerce and Management Studies, University of Calicut).

[203] India's Evolving Carbon Credit Market. (n.d.). Invest India. https://www.investindia.gov.in/team-india-blogs/indias-evolving-carbon-credit-market

Shri Raj Kumar Singh, Hon'ble Cabinet Minister (Power, New & Renewable Energy) in a recent discussion said, "Carbon credits are not going to be exported. No question. These credits will have to be generated by domestic companies, bought by domestic companies."

See also, "The renewed focus towards controlling GHG emissions and moving towards carbon neutrality, with specific milestones, is expected to encourage increased private sector participation in combating climate change. These commitments would drive demand for voluntary carbon credits in India. The annual demand for voluntary carbon credit in India is expected to touch 500+ mn units by 2030."

Incorporating Industrial Sectors into India's Emissions Trading Scheme: Strategic Insights from New Zealand and Tokyo

The Manufacturing Sector is one of the emerging sectors in India. Recently, India has launched the "Make in India" campaign to recognize India as a manufacturing hub on the global map which will also provide recognition to the Indian economy and with it. India has attained its expected target, that India will become the fifth largest manufacturing country in the world with a 7% GDP growth and a steep growth in the manufacturing sector which has become one of the essential figures to have caused a huge impact on the Gross Domestic Product (GDP).[204] Presently, in India, the contribution of the manufacturing sector in GDP is 16-23 percent and the Government of India has set a target that it shall be 25 percent by 2025. It is expected that India's manufacturing sector will become US$ 1 trillion by 2025 (IBEF, 2017).[205] Now, carbon credit has begun to be traded like any other commodity in India and Multi Commodity Exchange (MCX) of India has become the first exchange to trade carbon credits in India.[206]

When establishing an Emissions Trading Scheme (ETS), a crucial consideration is the selection of industries to be included. This decision must account for various factors, such as the region-specific emission profiles, the financial health of the entities involved, and the potential economic impact.[207] The ETS implementations in New Zealand and Tokyo illustrate how these factors can be carefully evaluated. New Zealand, for instance, has an unusual emissions profile where agriculture is the primary source of greenhouse gas (GHG) emissions, contributing 47.9% of the total emissions in 2014-2015.[208] Unlike many other developed and developing nations, New Zealand's transportation and energy sectors are responsible for only 18.3% and 10.1% of CO2 emissions, respectively. Given this unique emissions distribution, the New Zealand Government included the agriculture and forestry sectors within its ETS framework, requiring allowance holders to surrender allowances in cases of deforestation.[209] In Tokyo, commercial and residential buildings are significant contributors to CO2 emissions, accounting for 62.6% of the city's total emissions. Tokyo's ETS was pioneering in its inclusion of these buildings, targeting those with a

[204] See https://indbiz.gov.in/india-ranks-30-on-global-manufacturing-index/ Last accessed 18 April 2024

[205] https://www.ibef.org/industry/manufacturing-sector-india Manufacturing Sector in India: Market Size, FDI, Govt Initiatives | IBEF. (n.d.). India Brand Equity Foundation. Last accessed 18 April 2024

[206] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1962137 Activities finalised to be considered for trading of carbon credits under Article 6.2 mechanism to facilitate transfer of emerging technologies and mobilise international finance in India.
Posted On: 17 FEB 2023 5:50PM by PIB Delhi

[207] Abrell, J., Cludius, J., Lehmann, S., Schleich, J. and Betz, R., 2022. Corporate emissions-trading behaviour during the first decade of the EU ETS. Environmental and Resource Economics, 83(1), pp.47-83.

[208] Bracey, M., 2017. New Zealand's emissions trading scheme: An in-depth examination of the legislative history. New Zealand Journal of Environmental Law, 21, pp.133-169.

[209] ibid

total annual fuel, heating, and electricity consumption of at least 1,500 kiloliters (in crude oil equivalent).[210]

For India, it is proposed that the central regulatory authority (RA) should include highly carbon-intensive industries, such as the power sector, within the ETS.[211] Additionally, state governments should have the authority to expand the list of covered entities, considering the state's specific emissions profile, the need to minimize the economic impact on key sectors, and addressing unique socio-economic challenges. For example, in states like Madhya Pradesh and Chhattisgarh, which have high forest densities, forests should be included in the ETS. This inclusion would incentivize the expansion of forest cover and help prevent deforestation, aligning with the region's environmental priorities and socio-economic context.[212]

India's Strategic Approach to Carbon Markets: Balancing Domestic and International Frameworks under the Paris Agreement

India's approach to carbon markets under the Paris Agreement's Article 6 emphasizes the establishment of a distinct Indian Carbon Market (ICM) while harmonizing with global standards.[213] This strategic framework is designed to achieve several key objectives. First, it mandates specific entities within India to reduce greenhouse gas (GHG) emissions, ensuring that these reductions are transparently monitored and recorded to substantiate claims for carbon credits. Second, the policy signifies the separation of the domestic carbon market from its international counterpart, highlighting that credits issued domestically cannot be used interchangeably with those governed by international protocols. Third, by aligning with India's Nationally Determined Contributions (NDCs), the targets set for obligated entities in the domestic market aim to reduce the intensity of GHG emissions relative to GDP. Finally, as India integrates its carbon market mechanisms with global frameworks like Article 6,[214] The overarching goal is to enhance the efficacy of carbon pricing, stimulate emission reductions across diverse sectors, and contribute effectively to global climate mitigation efforts. This approach highlights India's commitment to navigating the complexities of carbon trading while safeguarding environmental integrity on both domestic and international fronts.

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[210] Iliopoulos, N., Farzaneh, H. and Ohgaki, H., 2019. Tokyo's low-emission development strategies underlying the promotion of energy efficiency in public and private buildings. Devising a Clean Energy Strategy for Asian Cities, pp.205-222.

[211] Hoffmann, V.H., 2007. Eu ets and investment decisions: The case of the german electricity industry. European Management Journal, 25(6), pp.464-474.

[212] Janghu, S. and Rosencranz, A., 2018. Fighting India's war on carbon with an emissions trading program. Nat'l LU Delhi Stud. LJ.

[213] Sarkar, A.N. and Banerjee, D.K., 2010. Global climate change: a strategic and operational framework for future negotiations beyond Copenhagen. Asia Pacific Business Review, 6(1).

[214] Gajjar, C., Chakrabarty, S. and Shah, P., 2022. Estimating the Impact of Corporate Science-based Emissions Targets on India's Nationally Determined Contribution Goals. Working Paper, World Resource Institute.

- **Domestic Carbon Market Responsibilities:**

In India's proposed framework, the domestic carbon market would mandate certain entities, termed "obligated entities," to reduce their greenhouse gas (GHG) emissions.[215] These entities must achieve actual reductions, which are closely monitored and transparently recorded. This ensures that any claims for carbon credits based on these reductions are credible and verifiable. Transactions involving these credits are also carefully monitored to prevent double counting, where the same emission reduction is counted more than once.[216]

The government's preliminary policy document delineates the separation of the Indian Carbon Market (ICM) and its interaction with the global carbon market under Article 6 of the Paris Agreement, highlighting several essential aspects:

- **Distinction Between Domestic and International Markets**

The Indian policy emphasizes that the domestic carbon market is distinct from the international carbon market governed by Article 6 of the Paris Agreement.[217] This distinction is crucial because it means that credits issued under domestic regulations cannot be used interchangeably with those issued under international protocols.[218] Each market operates under its own set of rules and serves different purposes within the broader framework of global climate action.

- **Carbon Credit Issuance and Compliance**

Carbon credits issued within India for the domestic market must adhere strictly to national regulations. In contrast, credits intended for international trading under Article 6[219] must meet stringent international standards and procedures, including those related to Monitoring, Reporting, and Verification (MRV). This ensures that carbon credits traded internationally uphold environmental integrity and contribute effectively to global climate goals.[220] As we talk of the issuance of credits, it is important to look into the aspect of credit allocation as well. The allocation of allowances entails numerous complex technical and economic considerations, such as

[215] Jaspal, M., 2023. Towards effective carbon trading markets for emerging economies: The evolving Indian experience. Observer Research Foundation, 9, p.95.

[216] Juvonen, J., 2021. Corporate Carbon Neutrality Claims and the Legal Effect of Double Counting. Institute for International Finance, p.26.

[217] Michaelowa, A., Shishlov, I. and Brescia, D., 2019. Evolution of international carbon markets: lessons for the Paris Agreement. Wiley Interdisciplinary Reviews: Climate Change, 10(6), p.e613.

[218] Michaelowa, A., Shishlov, I., Hoch, S., Bofill, P. and Espelage, A., 2019. Overview and comparison of existing carbon crediting schemes.

[219] See https://unfccc.int/process/the-paris-agreement/cooperative-implementation

"Article 6 of the Paris Agreement recognizes that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.

Decision 1/CP.21 mandated the SBSTA to operationalize the provisions of this Article through recommending a set of decisions to the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its first session."

[220] Kim, S.K. and Huh, J.H., 2020. Blockchain of carbon trading for UN sustainable development goals. Sustainability, 12(10), p.4021.

determining the number of allowances to be distributed to states and various sectors,[221] the intra-industry sub-allocation of allowances, and the pricing strategy for auctioning or awarding the initial allowances.

Mirroring the EU ETS, the Indian ETS could allocate the majority of the allowances (88% in the EU) based on historical emissions data. A portion of the allowances (10% in the EU) could be allocated to less developed states to facilitate their growth, while the remaining allowances (2% in the EU ETS) could be awarded to states that have demonstrated early efforts in carbon reduction.[222] The states, in coordination with the regulatory authority (RA), should be responsible for distributing allowances among the entities within their jurisdiction. This approach would foster cooperative federalism, consider various factors such as each state's historical emissions, provide growth opportunities for less developed states, and establish an incentive system for states to encourage emission reductions among their residents.

Initially, it may be advisable to distribute the allowances at no cost.[223] This strategy would serve multiple purposes. It would help garner acceptance from industry and businesses, which are likely to resist the new regulations due to increased compliance costs.[224] Providing free allowances would alleviate their concerns and discomfort, preventing companies from relocating operations to countries without such regulations and allowances. This would avoid merely shifting global carbon emissions from India to another country while damaging the local economy. Additionally, it would protect energy-intensive industries from international competition. [225]

- **Role of Nationally Determined Contributions (NDCs)**

The targets assigned to obligated entities in the domestic market align with India's NDCs. These targets aim to reduce the intensity of greenhouse gas emissions relative to GDP.[226] Any additional emissions reductions achieved beyond these targets may qualify for international carbon credits under Article 6 mechanisms, provided they meet the necessary international criteria.

[221] Gao, Y., Liu, G., Meng, F., Hao, Y., Chen, C. and Casazza, M., 2024. A carbon responsibility allocation approach with incentives mechanism based on carbon emissions and carbon offsets accounting. Journal of Cleaner Production, 434, p.139814.

[222] See, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation_en Energy, Climate change, Environment - Free allocation - Allocation to industrial installations - Allocation to modernize the energy sector etc. Last accessed 19 April 2024

[223] Lintner, J., 1956. Distribution of incomes of corporations among dividends, retained earnings, and taxes. The American economic review, 46(2), pp.97-113.

[224] Gambhir, A., Napp, T.A., Emmott, C.J. and Anandarajah, G., 2014. India's CO2 emissions pathways to 2050: Energy system, economic and fossil fuel impacts with and without carbon permit trading. Energy, 77, pp.791-801.

[225] ibid

[226] Gajjar, C., Chakrabarty, S. and Shah, P., 2022. Estimating the Impact of Corporate Science-based Emissions Targets on India's Nationally Determined Contribution Goals. Working Paper, World Resource Institute.

- **Integration and Evolution of the Carbon Market**

The policy document outlines how the ICM will evolve alongside international frameworks like Article 6. This evolution is necessary to ensure that carbon credits generated in India, whether used domestically or traded internationally, maintain environmental integrity and contribute effectively to global efforts to combat climate change.[227] Measures are also in place to prevent double counting of emission reductions, ensuring that each reduction is accounted for only once in global carbon markets.

India's Evolving Carbon Credit Trading Framework: Addressing Key Challenges on the Path Towards Sustainable Development

The implementation of an Emissions Trading Scheme (ETS) in India raises significant challenges concerning its compatibility with existing frameworks like the Clean Development Mechanism (CDM) and the Perform Achieve and Trade (PAT) scheme. Thus, the viability of ETS as a potential policy option hinges on its design considerations. In examining India's readiness for a national ETS, Harrison et al. (2008)[228] categorize the public policy issues into three main areas: establishing the scheme itself (design definition), addressing concerns about competitiveness and potential carbon leakage among participating entities, and ensuring coherence when linking with other ETS schemes globally.[229]

According to Tyler et al. (2009), the defining factor determining the success of an ETS lies primarily in how its design and fundamental components are structured.[230] This discussion primarily focuses on national political dynamics and emphasizes specific design elements critical for India, including the regulatory point, greenhouse gas (GHG) emissions and their sources, and the method chosen for allocating emission permits. These elements are pivotal in shaping the effectiveness and applicability of an ETS within India's unique socio-political context.[231] Emissions trading systems can adopt either upstream, involving emissions trading at the level of fuel providers like mining industries, or downstream, regulating emissions directly from sources

[227] https://www.ceew.in/publications/implications-of-carbon-emissions-trading-system-in-indias-net-zero-strategy Council On Energy, Environment And Water - Integrated | International | Independent

[228] Harrison, D., Klevnas, P., Nichols, A.L., Radov, D., 2008, 'Using emissions trading to combat climate change: programs and key issues', Environmental Law Reporter 38(6): 10367–10384 [available at http://ssrn.com/abstract=1140808]

[229] Upadhyaya, P., 2010. Mitigation in India: Emission trading as a possible policy option. Putting a price on carbon, 3, pp.151-165.

[230] Tyler, E., Toit, M.D., Dunn, Z., 2009, Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa, Energy Research Centre, University of Cape Town, Cape Town

[231] Kapila, R.V., 2015. International politics of low carbon technology development: carbon capture and storage (CCS) in India.

such as manufacturing industries.[232] The upstream approach targets fewer specific sources, offering simplicity in administration and monitoring, while the downstream approach covers a broader range of emission sources, providing more liquidity and flexibility.

In Europe, the EU Emissions Trading System (EU ETS) employs a downstream approach, encompassing nearly 12,000 installations and addressing about half of the EU's CO2 emissions.[233] In contrast, the Regional Greenhouse Gas Initiative (RGGI) in the USA currently focuses solely on power plants across ten states (Litz, 2009a), with various proposals in the US considering both downstream and upstream emitters.[234] Given the context discussed earlier, an upstream approach appears suitable for India, particularly since these entities are not covered by the PAT scheme. India also hosts a significant number of SMEs, which pose challenges for inclusion in a comprehensive cap-and-trade scheme. Focusing on upstream players could potentially mitigate the conflicts mentioned earlier. However, it is essential to determine the extent to which total emissions would be effectively covered under such an approach. [235]

It is of huge significance that a country emancipates the best and worst of a future policy it dearly looks forward to. With regard to the scenario at hand, the rare but practically possible cases of Carbon Leakage can be a huge threat and pose a challenge to developing countries. Offset project proposals often hinge on predictions and emerging technologies with limited data on greenhouse gas (GHG) reductions, raising concerns about carbon leakage. To mitigate these risks, emissions trading systems (ETSs) incorporate a 'discount factor'. For instance, RGGI applies a 10% discount on carbon allowances to prevent potential reversals in sequestered carbon. This requirement can be waived if developers secure long-term insurance for replacement of failed sequestration efforts. Canada's Offset System Quantification Protocol utilizes sector-specific discount factors, while Alberta employs an 'assurance factor approach', assuming liability to ensure emission reductions' permanence post-discount. These measures aim to address carbon leakage risks and uncertainties, encouraging technological innovation while safeguarding emission reduction goals. As India seeks

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[232] Kerr, S. and Duscha, V., 2014. Going to the source: using an upstream point of regulation for energy in a national Chinese emissions trading system. Energy & Environment, 25(3-4), pp.593-611.

[233] https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/eu-emissions-trading-scheme-eu-ets "The European Union Emissions Trading Scheme (EU ETS) - puts a cap on the carbon dioxide (CO2) emitted by business and creates a market and price for carbon allowances. It covers 45% of EU emissions, including energy intensive sectors and approximately 12,000 installations.
The EU ETS scheme started in 2005 in order to help the EU meet its targets under the Kyoto Protocol (8% reduction in greenhouse gas emissions from 1990 levels)." last accessed 12 May 2024

[234] https://www.nrcm.org/programs/climate/climate-change/facts-about-rggi-regional-greenhouse-gas-initiative/ - RGGI - "RGGI is an effective and practical solution to address global warming. The program is one of the most important steps in Maine's Climate Action Plan, our state's plan to reduce greenhouse gas emissions. It also creates incentives for energy efficiency and clean, renewable power – good for our health and a necessary step to achieve our energy independence. The initiative increases Maine's impact by joining with nine other northeastern states. Together these states add up to the seventh largest source of global warming pollution in the world. More than 30% of this pollution comes from dirty power plants."
"The approach developed through the Regional Greenhouse Gas Initiative rewards innovation and demonstrates that the region can address climate change using a market-based approach." —Bank of America

[235] https://think.ing.com/articles/how-will-the-eus-carbon-border-tax-affect-global-metals-trade/ *How the EU's carbon border tax will affect the global metals trade.* (Last accessed - 13 May 2024)

to enhance its climate change mitigation efforts, especially within sectors like renewable energy and forestry, considerations around the reliability of emission reductions from offset projects become crucial.[236] Implementing mechanisms akin to discount factors, as seen in other emissions trading systems, could help mitigate risks associated with speculative emission reductions. This approach could foster confidence in the integrity of offset projects in India, encouraging investments in sustainable technologies while ensuring they contribute effectively to national and global emission reduction goals.[237]

From a political standpoint, implementing an Emissions Trading Scheme (ETS) does not currently seem feasible as it may contradict the government's development priorities.[238] Institutionally, an ETS would conflict with both the Clean Development Mechanism (CDM) and the Perform Achieve and Trade (PAT) scheme in terms of coverage, raising concerns about double counting.[239] For an ETS to be viable, its scope must be carefully defined to avoid overlapping with CDM and PAT. Further study is needed to understand its relationship with Nationally Appropriate Mitigation Actions (NAMAs), though establishing an ETS could potentially qualify as a NAMA depending on its design and implementation agreements.[240] In India, an ETS would encounter significant design challenges. Addressing these challenges could help resolve conflicts with existing mechanisms. Adopting an upstream approach would mitigate conflicts with the PAT scheme.[241] While national level emissions inventory processes are improving, there is a need for more extensive corporate-level emissions reporting in India.[242] Despite recent criticisms, grandfathering

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[236] Gössling, S., Broderick, J., Upham, P., Ceron, J.P., Dubois, G., Peeters, P. and Strasdas, W., 2007. Voluntary carbon offsetting schemes for aviation: Efficiency, credibility and sustainable tourism. Journal of Sustainable tourism, 15(3), pp.223-248.

[237] Söderholm, P. (2020). The green economy transition: the challenges of technological change for sustainability. Sustainable Earth, 3(1). https://doi.org/10.1186/s42055-020-00029-y

" Investments are often large-scale and exhibit increasing returns. Path dependencies are also aggravated by the fact that the outputs from different energy sources – and regardless of environmental performance – are more or less perfect substitutes. In other words, the emerging and carbon-free technologies can only compete on price with the incumbents, and they therefore offer little scope for product differentiation. In addition, the energy sectors are typically highly regulated, thus implying that existing technological patterns are embedded in and enforced by a complex set of institutions as well as infrastructure."

[238] Grubb, M. and Neuhoff, K., 2006. Allocation and competitiveness in the EU emissions trading scheme: policy overview. Climate Policy, 6(1), pp.7-30.

[239] Chatterjee, P. (2024, May 27). Decarbonizing MSMEs through the Indian Carbon Market: A Comprehensive Exploration. King Stubb & Kasiva. https://ksandk.com/newsletter/decarbonizing-msmes-through-the-indian-carbon-market/

"While ETS introduces a progressive mechanism for MSMEs to engage in emissions reduction, challenges such as the establishment of accurate baselines and monitoring mechanisms persist. However, opportunities arise in the form of financial incentives, access to carbon finance, and enhanced environmental credibility."

[240] Schneider, L., Duan, M., Stavins, R., Kizzier, K., Broekhoff, D., Jotzo, F., Winkler, H., Lazarus, M., Howard, A. and Hood, C., 2019. Double counting and the Paris Agreement rulebook. Science, 366(6462), pp.180-183.

[241] Tang, Qingliang, and Luo, L. (2016). Corporate ecological transparency: Theories and empirical evidence. Asian Rev. Account. 24 (4), 498–524. doi:10.1108/ARA-01-2015-0007

[242] Hazaea, S. A., Al-Matari, E. M., Alosaimi, M. H., Farhan, N. H. S., Abubakar, A., & Zhu, J. (2023). Past, present, and future of carbon accounting: Insights from scholarly research. Frontiers in Energy Research, 10. https://doi.org/10.3389/fenrg.2022.958362

"..... it is believed that conducting studies in countries with a large industrial impact, such as China, India, Malaysia,

where existing participants receive emission allowances based on historical emissions may still be advantageous, especially under an upstream approach with fewer participants, during the initial stages.

In the case of India, The Ministry of Environment and Forests must examine necessary legal amendments to integrate emissions trading into the current pollution regulatory framework. A robust regulatory structure is essential to legally connect emissions trading with existing laws.[243] Industries need assurance that trading permits comply with regulatory requirements for the scheme to gain acceptance and effectiveness. The Ministry faces critical inquiries in establishing an emissions trading framework which can be laid down as -

1. What legal revisions are required to transition from current emissions standards to pollution permits?
2. How will permits be distributed and what legal responsibilities will permit holders carry?
3. Who will finance the expenses for monitoring equipment and central resources, possibly through auctioning a portion of permits?
4. What are the overarching national objectives of this initiative? How will local programs align to foster stronger market integration at city or state levels in the future?[244]

Even as we entail the number of factors the government would have to look into, it is highly noteworthy to point that in 2024, India implemented a substantial overhaul of its Carbon Credit Trading Scheme (CCTS), expanding participation to include non-obligated entities in the tradable carbon credits market. This revision permits companies and individuals to voluntarily utilize carbon credits to mitigate their emissions contributing to global warming. The revised scheme introduces an offset mechanism allowing these entities to register projects and obtain tradable carbon credit certificates (CCCs),[245] each representing one tonne of carbon dioxide equivalent (tCO_2e).[246] The primary objective is to establish an efficient pricing mechanism for emissions through CCC trading and foster growth in the voluntary carbon market. India initiated the 2023 Carbon Credit Trading Scheme (CCTS), encompassing both mandatory compliance and voluntary

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Japan, and Russia, in which we expect large emissions, and developing countries may contribute to knowing the practice of carbon accounting more clearly, which facilitates providing a clearer and balanced vision on the effects of climate change and the role of carbon accounting in mitigating emissions."

[243] BLOG May 30, 2023 India's draft carbon market framework: Building stakeholder confidence https://www.spglobal.com/commodityinsights/en/ci/research-analysis/indias-draft-carbon-market-framework-building-stakeholder-conf.html last accessed 14 May 2024

[244] Duflo, Esther, et al. Towards an Emissions Trading Scheme for Air Pollutants in India. MIT Center for Energy and Environmental Policy Research, 2010. JSTOR, http://www.jstor.org/stable/resrep34686

[245] Adititandon. (2023, April 26). India prepares for a domestic carbon market with release of a draft carbon trading scheme. Mongabay-India. https://india.mongabay.com/2023/04/india-prepares-for-a-domestic-carbon-market-with-release-of-a-draft-carbon-trading-scheme/ Last accessed 19 May 2024

[246] See, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/111722-india-consults-on-launch-of-complianceoffset-carbon-market-in-2023 India consults on launch of compliance/offset carbon market in 2023, Last accessed 19 May 2024

sectors.[247] While the compliance segment is slated to commence in 2025-26, there is currently no specified timeline for the launch of the voluntary carbon market.

Under the revamped scheme, obligated entities now have flexibility to purchase additional credits or sell surplus ones, while businesses can trade CCCs to offset their emissions. Sectors encountering challenges in meeting reduction targets, especially those with hard-to-abate emissions, are exploring trading options such as energy-saving certificates (ESCerts) and renewable energy certificates (RECs) as offsets.[248] Following its successful hosting of the G20 Summit and significant additions to its non-fossil energy capacity, including 17 GW in total and 13.8 GW in non-fossil additions in 2023, India has become an attractive destination for investments in energy transition.[249] Renewable energy has notably expanded its share in the country's electricity supply capacity. Adding to it, India has enhanced financial support for advancing the green hydrogen ecosystem and initiated preparations for its domestic carbon markets. Key decisions concerning international participation in the carbon credit market are expected this year as suggested by various sources across the country which would mark as a remarkable milestone in defining India's future engagement. Discussions must be encouraged to address the scheme's scope, design, procedures, and alignment with international standards and registries to revamp the existing and cover the loopholes that may denote inefficiency. Perhaps it is vividly meaningful to say, India's revised CCTS marks a significant stride in global decarbonization efforts. Coupled with robust growth in the global carbon trading market, these developments highlight a promising trajectory towards reducing greenhouse gas emissions worldwide.

[247] Roy, A. and Bhan, M., 2024. Forest carbon market-based mechanisms in India: Learnings from global design principles and domestic barriers to implementation. Ecological Indicators, 158.

[248] Barker, A., Blake, H., D'Arcangelo, F.M. and Lenain, P., 2022. Towards net zero emissions in Denmark.

[249] India Revises Its Carbon Credit Trading Scheme for Voluntary Players. (2024, February 22). https://globalcarbonfund.com/carbon-news/india-revises-its-carbon-credit-trading-scheme-for-voluntary-players/ last accessed 11 June 2024

"...India emerged as a favorable destination for energy transition investments after successfully hosting the G20 Summit last year. During the same year, the country added about 17 GW of capacity, with non-fossil additions accounting for 13.8 GW."

"...India's strategy will prioritize various aspects in power and renewables market, including:

Clean energy transition advancing, Electricity demand to grow with GDP growth, driven by local activity due to elections and El-Nino impact. Total capacity addition to grow by 60% YoY; coal share in generation to decrease marginally to 73.2% in 2024. Improving domestic fuel supply (Coal and Gas) remains top priority"

CHAPTER 4:
INTERFACE OF THE CET POLICY WITH TRADE - A GLOBAL ASPECT

Introduction

The implementation of carbon emission trading schemes weaves a complex tapestry of both formidable barriers that may particularly stand as an obstruction to the promising growth of a state and its enterprises but at the same time it may be a promising path to incentivize and catalyze international trade. But the aspect of the output is something that totally relies on the perspective a country wishes to foster. It would depend highly on the approach and the regulatory framework a nation builds to enamor the prospects of carbon emission trading. Amidst the clamor of global markets, these schemes impose an intricate collaboration of regulatory frameworks that elevate the production costs for industries bound by stringent carbon policies.[250] This may not be a favorable outcome, not in the least to the nations that thrive on trade, which is exactly what keeps the world in one piece at the moment.[251] In regions where environmental rigor prevails, companies grapple with heightened operational expenditures, their competitive edge dulled against counterparts in territories of regulatory leniency. This disparity risks the specter of carbon leakage, as businesses may seek refuge in nations with more permissive environmental mandates. As does the tax havens are caused by entities that seek leniency to cut across the laws, so would this lead to carbon havens around the globe.[252] Yet, within this web of challenges lies a silver thread of opportunity. One that the present generation and the international agencies must not turn a blind eye to. Carbon trading undoubtedly ignites the spark of innovation and efficiency, as the statistics and the 'round the world' cases that have successfully implemented the policy depicts[253]. As explained by the Porter

[250] Bataille, C., Åhman, M., Neuhoff, K., Nilsson, L.J., Fischedick, M., Lechtenböhmer, S., Solano-Rodriquez, B., Denis-Ryan, A., Stiebert, S., Waisman, H. and Sartor, O., 2018. A review of technology and policy deep decarbonization pathway options for making energy-intensive industry production consistent with the Paris Agreement. *Journal of Cleaner Production*, *187*, pp.960-973.

[251] Matthew O. Jackson: Can Trade Prevent War? (2024, May 3). Stanford Graduate School of Business. https://www.gsb.stanford.edu/insights/matthew-o-jackson-can-trade-prevent-war last visited 4 June 2024

"Economic trade, however, makes a significant difference. "Once you bring in trade, you see network structures densify," he says. Nations form a web of trading alliances, which creates financial incentive not only to keep peace with trading partners, but also to protect them from being attacked so as not to disrupt trade. "In the context of the alliances we have analyzed, trade motives are essential to avoiding wars and sustaining stable networks," the authors wrote in their paper, Networks of Military Alliances, Wars, and International Trade."

"Economic interests can really help us have a more peaceful world than we already have."

[252] Ishikawa, J. and Okubo, T., 2016. Greenhouse-gas emission controls and international carbon leakage through trade liberalization. *The International Economy*, *19*, pp.1-22.

[253] Liu, B., Sun, Z. and Li, H., 2021. Can carbon trading policies promote regional green innovation efficiency? Empirical data from pilot regions in China. *Sustainability*, *13*(5).

Hypothesis, it envisions that well-crafted environmental regulations act as harbingers of competitiveness by being the very catalyst of innovation.[254] Enterprises that adeptly curtail their emissions find themselves with surplus allowances to trade, translating regulatory compliance into financial gain.[255] This dynamic fosters investment in cleaner technologies, not merely curbing emissions but also elevating these companies as vanguards of sustainability,[256] their market standing bolstered and new vistas of opportunity unfolding before them. [257]

Carbon emission trading schemes possess a Janus-faced nature, capable of both bestowing benefits and inflicting harm, contingent entirely upon the nuances of their implementation. When adroitly crafted, these policies can indeed become powerful tools for environmental stewardship and economic innovation,[258] fostering a marketplace where sustainability and profitability coexist to reap the best results. Conversely, poorly designed frameworks risk exacerbating economic inequities, driving businesses to relocate to less regulated regions, and undermining the very environmental goals they aimed to achieve in the first place.[259] Further down the lane, the chapter delves into the intricate interplay between policy and international trade through the lens of carbon emission trading, exploring how these schemes navigate the fine line between being a burden and a boon. The exploration of confluence between policy and international trade within the realm of carbon emission trading begins by examining the inherent barriers and incentives created by such schemes.[260] Industries facing rigorous carbon regulations often contend with increased production costs, which can erode their competitive edge on the global stage and even lead to carbon leakage, which is a highly possible potential risk in this area.[261] Further, the chapter investigates the impact of carbon emission trading on small-scale industries as the belief in the realm of development is to prioritize the developing and underdeveloped countries which automatically turns our focal

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[254] Lanoie, P., Laurent-Lucchetti, J., Johnstone, N. and Ambec, S., 2011. Environmental policy, innovation, and performance: new insights on the Porter hypothesis. *Journal of Economics & Management Strategy*, *20*(3), pp.803-842.

The Porter Hypothesis - "Properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them. Such "innovation offsets," as we call them, can not only lower the net cost of meeting environmental regulations, but can even lead to absolute advantages over firms in foreign countries not subject to similar regulations. Innovation offsets will be common because reducing pollution is often coincident with improving the productivity with which resources are used. In short, firms can benefit from properly crafted environmental regulations that are more stringent (or are imposed earlier) than those faced by their competitors in other countries. By stimulating innovation, strict environmental regulations can enhance competitiveness."

[255] See Kogan, L.A., 2005. How Europe employs disguised regulatory protectionism to weaken American free enterprise. *International Journal of Economic Development*, *7*(2-3), pp.65-412.

[256] Gerretsen, I. (2022, February 24). How trading CO2 could save the climate. https://www.bbc.com/future/article/20211018-climate-change-what-is-the-global-carbon-market last visited 4 June 2024.

[257] Leggett, J., 2018. *The winning of the carbon war: power and politics on the front lines of climate and clean energy*. Crux Publishing Ltd.

[258] Woerdman, E., 2000. Organizing emissions trading: the barrier of domestic permit allocation. *Energy Policy*, *28*(9), pp.613-623.

[259] Oke, A.E., Oyediran, A.O., Koriko, G. and Tang, L.M., 2024. Carbon trading practices adoption for sustainable construction: A study of the barriers in a developing country. *Sustainable Development*, *32*(1).

[260] ibid

[261] ibid

point towards the operation of small scale industries. These smaller entities often grapple with limited resources and expertise, making compliance more burdensome compared to their larger counterparts.[262] The analysis covers how these industries can either struggle under the weight of new regulations or thrive through support mechanisms and capacity-building initiatives.[263] Finally, as the greater good prevails in demanding the need of the hour, which is to critically save the planet and maintain sustainability, the chapter explores the role of carbon emission trading in promoting green trading and technological advancement.[264] By creating a market for carbon allowances, these schemes incentivize the adoption of green technologies and practices,[265] fostering a global transition toward sustainable development. The chapter emphasizes how well-implemented carbon trading systems not only reduce emissions but also drive technological progress, opening new avenues for economic growth and environmental preservation. To widen our understanding of these dynamics, we will further examine various comparative studies from across several countries that have incorporated the policy and delve into specific case studies to comprehend the same. By analyzing how different nations implement and adapt carbon trading schemes, we attain valuable insights into the factors that determine their success or failure. These comparative analyses and case studies will provide a nuanced perspective on the global implications of carbon emission trading, highlighting best practices and potential pitfalls in its application. The aim is to provide a balanced understanding of the multifaceted impacts of carbon emission trading on international trade and industry dynamics to serve the best course of the policy over time. An impact mechanism chart (Fig 4.1) depicts the multifaceted approach the policy has and covers the concept in its entirety. [266] This impact mechanism chart elucidates the intricate interplay between various design elements of an Emissions Trading System (ETS) and the pertinent issues under World Trade Organization (WTO) law.

The trading of allowances within an ETS raises complex questions under the General Agreement on Trade in Services (GATS).[267] Specifically, if allowances are classified as services, GATS regulations apply.[268] Conversely, if they are classified as goods, the General Agreement on Tariffs and Trade (GATT) rules are pertinent.[269] In cases where allowances do not clearly fit into either category, the applicability of specific rules becomes uncertain. This classification is crucial as it determines the applicable international trade regulations and their implications for ETS operations.

[262] Liebel, K., 2021. International Oil Companies: Largest Carbon Emitters Turned Low-Carbon Leaders. *Hous. L. Rev.*, *59*, p.175.
[263] ibid
[264] Chen, Z., Zhang, X. and Chen, F., 2021. Do carbon emission trading schemes stimulate green innovation in enterprises? Evidence from China. *Technological Forecasting and Social Change*, *168*.
[265] Wang, M., Wang, X., Liu, Z. and Han, Z., 2024. How can carbon trading promote the green innovation efficiency of manufacturing enterprises? *Energy Strategy Reviews*, *53*.
[266] Zhao, Z., Zhou, S., Wang, S., Ye, C. and Wu, T., 2022. The impact of carbon emissions trading pilot policy on industrial structure upgrading. *Sustainability*, *14*(17).
[267] Wiser, G., 2002. Frontiers in trade: the clean development mechanism and the general agreement on trade in services. *International Journal of Global Environmental Issues*, *2*(3-4), pp.288-309.
[268] Adlung, R., 2006. Public Services and the GATS. *Journal of International Economic Law*, *9*(2), pp.455-485.
[269] Hudec, R.E., 1971. GATT or GABB? The future design of the general agreement on tariffs and trade. *The Yale Law Journal*, *80*(7), pp.1299-1386.

The practice of receiving rebates on exportation is scrutinized under the Agreement on Subsidies and Countervailing Measures (ASCM),[270] where it is often perceived as a prohibited export subsidy. Such rebates may be viewed as violating international rules against unfair trade practices, potentially leading to disputes under WTO law.[271] The scrutiny intensifies as these rebates could confer undue advantages to domestic industries, distorting competitive landscapes.[272]

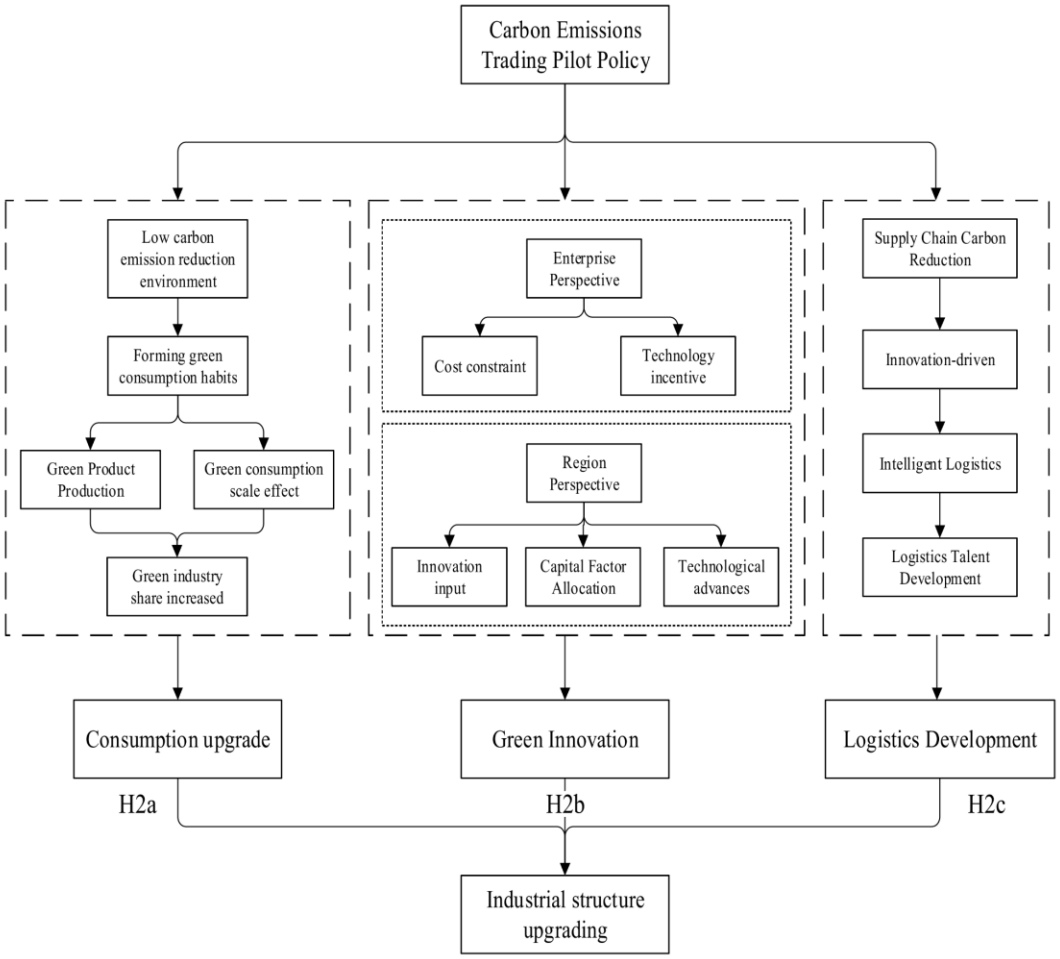
Recycling of revenues generated from the auctioning of allowances is another contentious area under the ASCM.[273] The manner in which these revenues are utilized is pivotal, as it can be considered an actionable subsidy if perceived to unfairly benefit domestic industries.[274] This issue necessitates a careful examination to prevent disputes that arise from perceived trade distortions.[275] The allocation of allowances, particularly when distributed freely or based on specific criteria, raises significant concerns under ASCM and Anti-Dumping (ADD) rules.[276] Free allocation can be perceived as a subsidy, thus requiring stringent justification to avoid contravention of WTO rules.[277] This element demands a balanced approach to maintain compliance while fostering fair competition. Yet another factor to note is the inclusion of imports within an ETS framework which navigate non-discrimination issues under GATT and GATS.[278] Ensuring that these measures are justified under the respective exceptions is essential to prevent trade disputes.

This aspect highlights the necessity of equitable treatment of domestic and foreign producers to uphold the principles of fair trade.[279] Reporting emissions and entering data into the registry is

[270] Hoda, A. and Ahuja, R., 2005. Agreement on subsidies and countervailing measures: need for clarification and improvement. *J. World Trade*, *39*.
[271] Veel, P.E., 2009. Carbon tariffs and the WTO: An evaluation of feasible policies. *Journal of International Economic Law*, *12*(3).
[272] ibid
[273] Holzer, K., 2016. WTO law issues of emissions trading.
[274] See, What You Need to Know About Abatement Costs and Decarbonization. (2023, April 21). World Bank. https://www.worldbank.org/en/news/feature/2023/04/20/what-you-need-to-know-about-abatement-costs-and-decarbonisation last accessed 15 June 2024
"Directing revenue from auctions toward projects that generate tangible benefits is a keyway to increase the political and social acceptability of an ETS. In practice this often includes climate, energy, and transport investments to further the transition to a low-carbon economy as well as compensating groups that may be disadvantaged by carbon pricing. Most systems auction at least a portion of their allowances or are moving toward introducing auctioning, but this paper focuses on systems that have a longer history of holding regular auctions and using the proceeds: the European Union (EU ETS), California, Québec, and the Regional Greenhouse Gas Initiative (RGGI). By the end of 2018, these systems and Switzerland had raised over USD 57 billion in revenue from auctioning emissions allowances."
[275] Charnovitz, S., 2003. Trade and climate: potential conflicts and synergies. *Beyond Kyoto: Advancing the international effort against climate change*, *141*, p.143.
[276] Hoda, A. and Ahuja, R., 2005. Agreement on subsidies and countervailing measures: need for clarification and improvement. *J. World Trade*, *39*.
[277] Sykes, A.O., 2010. The questionable case for subsidies regulation: a comparative perspective. *Journal of Legal Analysis*, *2*(2), pp.473-523.
[278] Bartels, L., 2012. The WTO legality of the application of the EU's emission trading system to aviation. *European Journal of international law*, *23*(2), pp.429-467.
[279] Howard, R.J., Tallontire, A.M., Stringer, L.C. and Marchant, R.A., 2016. Which "fairness," for whom, and why? An empirical analysis of plural notions of fairness in Fairtrade Carbon Projects, using Q methodology. *Environmental science & policy*, *56*, pp.100-109.

fundamentally about ensuring compliance and transparency. Moreover, the adherence to robust reporting standards is crucial to maintain the integrity of the ETS and align with international norms, thus avoiding potential conflicts.[280] Hence the process of surrendering allowances from the registry account underscores the importance of compliance with established rules. This step is vital for preserving the legality and integrity of the ETS within the purview of international trade regulations.

Figure 4.1



Linking or utilizing allowances/credits from other ETS or non-ETS projects, such as the Clean Development Mechanism (CDM), introduces non-discrimination issues under GATT, GATS, and

[280] Carvalho, M., Meneses, M., Amellina, A., Álvarez Campo, C. and Kreibich, N., 2022. Offset approaches in existing compliance mechanisms: adding value and upholding environmental integrity?

the Technical Barriers to Trade (TBT).[281] Ensuring that these linkages are implemented in a non-discriminatory manner is essential for harmonizing with international trade agreements and fostering global cooperation in emissions reduction. In summary, this chart[282] delineates the multifaceted legal considerations that an ETS must navigate within the framework of WTO law. It underscores specific areas of concern and the relevant WTO agreements that apply to each element, emphasizing the necessity of meticulous design and implementation to ensure compliance and foster fair international trade practices.

Navigating Carbon Emission Trading: Unveiling Barriers and Strategic Challenges

Carbon Emission Trading (CET) policies exert significant indirect economic influence by reshaping the cost dynamics and competitive landscape of regulated industries.[283] It is easier to say that the higher compliance costs compel these sectors to adapt production processes or seek cost-efficient solutions, potentially altering their global competitiveness across goods and services markets.[284] Moreover, countries implementing rigorous CET frameworks often integrate stringent environmental regulations and incentives which could adversely affect the nation.[285] This policy alignment not only impacts domestic industries or the small scale industries but also influences the international trade patterns as such, as businesses try and adjust to meet dual environmental and trade obligations.[286] Such alignment is pivotal in shaping production practices and market behaviors on a global scale. Also, the evolution and potential linkage of CET policies with international emissions trading systems establish standards that extend beyond the carbon markets.[287] This process sets precedents in environmental policy and trade agreements, thereby shaping global market expectations and practices as explained by the WTO.[288] These developments underscore the interconnectedness of environmental regulations and international trade dynamics, highlighting the broader implications of CET policies beyond their immediate carbon-related objectives.[289]

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[281] Ador, W.M., 2011. *Aspects of environmental norms under the world trade organization* (Doctoral dissertation, Kampala International University, School of Law).
[282] Zhao, Z., Zhou, S., Wang, S., Ye, C. and Wu, T., 2022. The impact of carbon emissions trading pilot policy on industrial structure upgrading. *Sustainability*, *14*(17).
[283] Gao, D., Tan, L., Mo, X. and Xiong, R., 2023. Blue sky defense for carbon emission trading policies: a perspective on the spatial spillover effects of total factor carbon efficiency. *Systems*, *11*(8).
[284] ibid
[285] Gonenc, R., Maher, M. and Nicoletti, G., 2000. The implementation and the effects of regulatory reform: past experience and current issues.
[286] Nicoletti, G., Golub, S.S., Hajkova, D., Mirza, D. and Yoo, K.Y., 2003. Policies and international integration: influences on trade and foreign direct investment.
[287] Jiang, J., Xie, D., Ye, B., Shen, B. and Chen, Z., 2016. Research on China's cap-and-trade carbon emission trading scheme: Overview and outlook. *Applied Energy*, *178*, pp.902-917.
[288] ibid
[289] ibid

As we dive into the core aspect of Carbon emission trading (CET) policies and their interjection to the realm of International Trade, we may say that the CET policies may be exemplified by systems like the EU Emissions Trading System (ETS) and analogous initiatives worldwide,[290] that are pivotal mechanisms designed to mitigate greenhouse gas emissions by imposing a price on carbon. While these policies concentrate on emissions stemming from sectors such as energy, industry, and aviation, their influence extends to global commodity markets and international trade in multifaceted ways.[291] This may be the turning point that calls for much discussion from experts and policymakers around the world. The interface may advance the environmental regulations to an extent that the trade around the globe gets affected directly or indirectly. If the question is framed as to how and to what extent the limitation may be imposed by such a carbon policy, then the answer to it may be one that depends on various factors both internal and external. The straight forth reasoning would be that the stringent laws laid down to curb the greenhouse gasses and promote a safer planet at the end of the day may cause a huge economic crisis.[292] International trade as explained before roots as the sole factor that halts the happening of another war amidst the countries,[293] truly saying that we are very much codependent on each other, and trade forms the foundation to this aspect. [294]

What happens is that the CET policy may introduce potential concerns regarding industrial competitiveness due to elevated operational costs induced by carbon pricing mechanisms.[295] Studies indicate that industries subject to stringent carbon pricing mechanisms can experience significant cost increases affecting their international competitiveness.[296] For instance, sectors covered by the ETS in the European Union have seen varying impacts; some industries have successfully adapted through technological innovation, while others face substantial cost burdens (European Commission, 2020). The developing countries that are usually the first to fall victim to such situations get affected the most. A country that cannot participate globally is said to have been affected in terms of their international competitiveness.[297] A country that cannot participate globally due to factors like reduced international competitiveness, potentially exacerbated by policies such as carbon emission trading, may experience economic stagnation, reduced foreign

[290] Dong, Y., & Whalley, J. (2010). Carbon, Trade Policy, and Carbon Free Trade Areas. World Economy, 33(9), 1073–1094. https://doi.org/10.1111/j.1467-9701.2010.01272.x last accessed 17 June 2024
[291] Brix, E.W. and Müller, M., Mitigating Climate Change Through the Market? A Critical Analysis of the European Union Emissions Trading System and Biomass Policies.
[292] Helm, D., 2012. *The carbon crunch: How we are getting climate change wrong—and how to fix it*. Yale. ORIM.; Bush, M.J. and Bush, M.J., 2020. How to end the climate crisis. Climate Change and Renewable Energy: How to End the Climate Crisis.; Geels, F.W., 2013. The impact of the financial–economic crisis on sustainability transitions: Financial investment, governance, and public discourse. *Environmental Innovation and Societal Transitions*, *6*.
[293] Bernstein, W.J., 2009. *A splendid exchange: How trade shaped the world*. Grove/Atlantic, Inc.
[294] Barkawi, T., 2006. *Globalization and war*. Rowman & Littlefield.
[295] Zhang, Y.J. and Shi, W., 2023. Has China's carbon emissions trading (CET) policy improved green investment in carbon-intensive enterprises? *Computers & Industrial Engineering*, *180*.
[296] Aldy, J.E. and Stavins, R.N., 2012. The promise and problems of pricing carbon: Theory and experience. *The Journal of Environment & Development*, *21*(2), pp.152-180.
[297] Lall, S., 2001. Competitiveness indices and developing countries: an economic evaluation of the global competitiveness report. *World development*, *29*(9).

direct investment,[298] and limited access to global markets. This can lead to slower economic growth, higher unemployment rates, and diminished opportunities for technological advancement and innovation. Additionally, such countries may face challenges in attracting skilled labor and retaining local talent, further hindering their ability to compete on a global scale.[299] Additionally, CET policies are construed as non-tariff trade barriers when they impose supplementary expenses on imported goods based on their carbon footprint.[300] Such measures can provoke disputes under international trade agreements, notably within the framework of the World Trade Organization (WTO), particularly if perceived as discriminatory or protectionist. The General Agreement on Tariffs and Trade (GATT)[301] and subsequent WTO agreements establish critical frameworks governing international trade relations. Article III of GATT[302] embodies the principle of national treatment, mandating that WTO members refrain from discriminating against imported goods in favor of domestic products concerning internal taxes and regulations.[303] This provision seeks to ensure equitable treatment and prevent undue advantage for domestic industries. Furthermore, Article XI of GATT[304], within its mandate for the general elimination of quantitative restrictions, prohibits WTO members from imposing measures like import quotas or other limitations that could act as barriers to trade. Such restrictions are scrutinized under WTO oversight to maintain the principles of open and non-discriminatory trade.

The Agreement on Technical Barriers to Trade (TBT Agreement) complements these principles by setting guidelines on technical regulations and standards.[305] It emphasizes transparency and non-discrimination in the formulation of such measures, aiming to minimize their potential to obstruct international trade.[306] Recent studies underscore the TBT Agreement's role in facilitating trade while accommodating legitimate policy objectives such as environmental protection through adherence to internationally recognized standards. Moreover, the Agreement on Subsidies and

[298] Amirahmadi, H. and Wu, W., 1994. Foreign direct investment in developing countries. *The Journal of Developing Areas*, *28*(2), pp.167-190.
[299] Aldy, J.E. and Stavins, R.N., 2012. The promise and problems of pricing carbon: Theory and experience. *The Journal of Environment & Development*, *21*(2)
[300] HAILEMESKEL, B., 2016. *The Economy-Wide Impact of Continental Free Trade Area (Cfta) On Ethiopia: A Recursive Dynamic Computable General Equilibrium Approach* (Doctoral dissertation, Addis Ababa University).
[301] General Agreement on Tariffs and Trade (adopted 30 October 1947, provisionally entered into force 1 January 1948) 55 UNTS 194, CTS No 31 (1948) (GATT)
[302] The text is focused on the interpretation of Articles III and XX of the 1994 General Agreement on Tariffs and Trade (hereinafter: the GATT 1994).1 Article III secures national treatment of imported products regarding internal taxation and non-fiscal regulation.
[303] Staiger, R.W. and Sykes, A.O., 2011. International trade, national treatment, and domestic regulation. *The Journal of Legal Studies*, *40*(1).
[304] Article XI of the GATT 1994 is the main provision regulating quantitative restrictions (QRs). Although Article XI of the GATT provides for the general elimination of quantitative restrictions, they are allowed in certain specific circumstances. Members' QR notifications seek to provide transparency on these measures, including on its WTO justification.
[305] Hoekman, B.M. and Mavroidis, P.C., 2016. A technical barrier to trade agreement for services? In *Research Handbook on Trade in Services* (pp. 243-267). Edward Elgar Publishing.
[306] Agreement on Technical Barriers to Trade (adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 120.

Countervailing Measures (SCM Agreement) addresses subsidies that distort global trade dynamics.[307] It specifically targets subsidies contingent upon export performance or those deemed detrimental to the interests of other WTO members. Recent analyses highlight the SCM Agreement's efficacy in curbing trade-distorting practices and promoting fair competition in international markets.[308] The Dispute Settlement Understanding (DSU) provides the procedural framework for adjudicating disputes arising from alleged violations of WTO agreements, including disputes related to non-tariff barriers.[309] This mechanism ensures the enforcement of WTO rules and facilitates the resolution of trade disputes through a structured and impartial process.[310] Which simply means that these foundational WTO agreements constitute essential instruments in regulating international trade relations. They uphold principles of fairness, transparency, and non-discrimination while accommodating diverse national policy objectives within the framework of a rules-based global trading system.

As we explore further, certain industries, particularly those characterized by high carbon intensity such as steel and cement production, face disproportionate impacts from CET.[311] These sectors encounter amplified costs under CET regimes, potentially influencing their global competitiveness and altering patterns of international trade.[312] For example, the International Monetary Fund (IMF) found that industries under carbon pricing mechanisms experienced cost increases ranging from 0.2% to 4.4% of total revenue, depending on their carbon intensity and cost-passing ability (IMF, 2021). Moreover, the lack of harmonization in CET designs and stringencies across diverse regions introduces complexities for global supply chains and trade accords.[313] Efforts towards international policy harmonization in CET could mitigate regulatory ambiguities and enhance predictability for businesses engaged in global trade.[314] In addition to economic repercussions, CET policies stimulate innovation in low-carbon technologies and practices. The adoption of CET policies has spurred significant investment in clean technologies and innovation.[315] For instance, the Global Carbon Capture and Storage Institute reports that over $15 billion was invested globally in carbon capture and storage projects by 2020, driven by carbon pricing mechanisms (Global CCS Institute, 2021). To add on, it is found that CET policies interact synergistically with other market-driven mechanisms, such as incentives for renewable energy adoption and standards promoting energy

[307] Secretariat, G.A.T.T., 1994. Agreement on Subsidies and Countervailing Measures (SCM Agreement). *The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts*, pp.264-314.
[308] ibid
[309] Zimmermann, T.A., 2006. *Negotiating the review of the WTO Dispute Settlement Understanding*. Cameron May.
[310] Davidson Ladly, S., 2012. Border carbon adjustments, WTO-law, and the principle of common but differentiated responsibilities. *International Environmental Agreements: Politics, Law, and Economics*, *12*, pp.63-84.
[311] Huisman, L., 2014. *The potential impact of carbon emissions tax on the South African mining industry* (Doctoral dissertation).
[312] Zaki, C., 2014. An empirical assessment of the trade facilitation initiative: econometric evidence and global economic effects. *World Trade Review*, *13*(1), pp.103-130.
[313] Brauer, J., 2023. *Creating markets for low-carbon hydrogen: economic perspectives on market design, regulation, and international trade* (Doctoral dissertation, Université Paris sciences et lettres).
[314] Ovádek, M. and Willemyns, I., 2019. International law of customs unions: Conceptual variety, legal ambiguity, and diverse practice. *European Journal of International Law*, *30*(2), pp.361-389.
[315] ibid

efficiency.[316] These interactions collectively influence broader market dynamics and reshape patterns of international trade within related sectors. Perhaps it is to say that while CET policies primarily target emissions reductions within specified sectors, their ramifications reverberate throughout global markets and international trade relationships.[317] Addressing these multifaceted impacts necessitates a delicate balance between climate imperatives and economic competitiveness, alongside adherence to international trade norms and agreements.

Speaking technically and economically, the degree of competition faced by industries from foreign producers varies significantly across different sectors.[318] Some products, such as bread, fresh bakery items, or newspapers, are predominantly produced and consumed within national borders that may count as domestic trade, with minimal international trade involvement. Consequently, concerns over international competition or distortions thereof are negligible even if production costs rise due to unilateral policy measures.[319] In contrast to the scenario, industries that export a substantial portion of their production or contend with significant import competition in domestic markets face the real plight with heightened policy challenges. Various indicators gauge the intensity of foreign competition in domestic markets. One such metric is the "exposure to foreign competition," as discussed by Coppel and Durand (1999)[320], OECD reports (2003a, 2003b), and analyses by Graichen and Matthes (1999)[321]. This indicator combines assessments of a sector's export orientation with the penetration of imports into the domestic market. A related measure, termed "trade intensity," was employed by Hourcade, Demailly, Neuhoff, and Sato (2007), which relates the total volume of traded goods to the overall market supply, encompassing both domestic production and imports.

$$\text{Trade Intensity} = \frac{\text{Exports}_{\text{regional}} + \text{Imports}_{\text{regional}}}{\text{Turnover} + \text{Imports}_{\text{total}}}$$

[316] Tan, Q., Han, J. and Liu, Y., 2023. Examining the synergistic diffusion process of carbon capture and renewable energy generation technologies under market environment: A multi-agent simulation analysis. *Energy*, *282*, p.128815.
[317] Devarajan, S., Go, D.S., Robinson, S. and Thierfelder, K., 2022. How carbon tariffs and climate clubs can slow global warming. *Peterson Institute for International Economics Working Paper*; Devarajan, S., Go, D.S., Robinson, S. and Thierfelder, K., 2023. Trade Policy as Climate Policy: Payoffs and Tradeoffs. *Available at SSRN 4653135*.; Zhang, C. and Lin, B., 2024. Impact of introducing Chinese certified emission reduction scheme to the carbon market: Promoting renewable energy. *Renewable Energy*, *222*.
[318] Böhringer, C., Fischer, C., Rosendahl, K. E., & Rutherford, T. F. (2022). Potential impacts and challenges of border carbon adjustments. Nature Climate Change, 12(1), 22–29. https://doi.org/10.1038/s41558-021-01250-z last accessed 15 June 2024
[319] Nivola, P.S., 2010. *Regulating unfair trade*. Brookings Institution Press.
[320] Coppel, J. and Durand, M., 1999. Trends in market openness.
[321] Matthes, F., Graichen, V., Repenning, J., Doble, C., Macadam, J., Taylor, S., Zanoni, D. and Chodor, M., 2005. The environmental effectiveness and economic efficiency of the European Union Emissions Trading Scheme: Structural aspects of allocation. A report to WWF. Berlin.

These indicators help reveal varying magnitudes across sectors, with significant disparities observed primarily in sectors characterized by substantial imports and limited exports. The key focus of this analysis rests on trade intensity, which provides a meaningful estimate of a country's trade dynamics with specific regions, notably those outside the European Union (EU) for the purposes of the EU Emissions Trading Scheme (ETS).[322] This scheme encompasses all EU member states, making it pertinent to calculate trade intensity with non-EU countries, reflecting both exports to and imports from this group relative to total market supply.[323] Moreover, an examination extends to trade with countries neither part of the EU nor the Organization for Economic Co-operation and Development (OECD), denoted as non-EU and non-OECD nations.[324] However, this approach does not account for scenarios where countries outside these groups implement policies that similarly elevate energy costs. Such policies could eliminate competitive advantages previously enjoyed by foreign producers vis-à-vis domestic counterparts facing increased CO2-related costs.[325] An examination of the trade configurations and the prospective financial implications that we have derived so far, we may say that it constitutes facets of the potential influence of the EU emissions trading system (ETS) on the global competitiveness of enterprises.[326] Recent analyses underscore the significance of understanding trade structures in assessing how carbon pricing mechanisms, such as the EU ETS, affect international business competitiveness to avoid such restrictions from being imposed.[327] Studies highlight varying degrees of cost pass-through ability across industries, influenced by factors such as market conditions, technological advancements, and regulatory frameworks.[328] For instance, sectors with high import exposure and limited ability to adjust prices may face greater challenges in maintaining competitive pricing amidst increased carbon-related costs.[329]

As we discuss the barriers and possible challenges a carbon policy can have on trade, be it domestic or international, it is highly important that the strategies to mitigate competitiveness impacts and leakage risks should ideally be tailored on a sector-specific basis. These could include measures like continued free allocation of emissions allowances, direct financial support to affected sectors, sectoral agreements, and border adjustment mechanisms.[330] Harmonized allocation rules across sectors, such as minimum auction requirements, are crucial to minimizing trade distortions

[322] Graichen, V., Schumacher, K., Matthes, F.C., Mohr, L., Duscha, V., Schleich, J. and Diekmann, J., 2008. Impacts of the EU Emissions Trading Scheme on the industrial competitiveness in Germany.
[323] ibid
[324] ibid
[325] Burchard-Dziubińska, M., 2011. Influence of the Climate Policy of the European Union on the Competitiveness of Pollution-generating Sectors of the Polish Economy in the Context of Sustainable Development. *Comparative Economic Research. Central and Eastern Europe*, *14*(4), pp.81-96.
[326] Hentrich, S., Matschoss, P. and Michaelis, P., 2009. Emissions trading and competitiveness: lessons from Germany. *Climate policy*, *9*(3), pp.316-329.
[327] ibid
[328] ibid
[329] Nanda, N., 2012. Trade and climate change: South Asian agenda at the UNFCCC and the WTO. *Regional Economic Integration*, p.227.
[330] Grubb, M. and Neuhoff, K., 2006. Allocation and competitiveness in the EU emissions trading scheme: policy overview. *Climate Policy*, *6*(1), pp.7-30.

especially when studied with reference to cases within the EU.[331] Also, when devising policies to address competitiveness concerns, it is essential to recognize that CO2 costs are just one factor influencing production and investment decisions for companies. Other critical considerations include product differentiation, market segmentation, intra-firm trade dynamics, labor costs, infrastructure quality, transportation expenses, political and legal environments, and exchange rate fluctuations, all of which merit detailed examination in the context of sector-specific impacts under the EU ETS.[332]

Delving into a case study conducted with reference to China, the strong establishment of China's carbon emission pilot trading market has significantly influenced strategic decisions in production and operations among the Chinese enterprises.[333] Our case study on the same has examined a sample of Chinese A-share listed companies spanning from 2009 to 2018,[334] to analyze the impact of carbon emission trading on corporate financial performance. The findings indicated that while carbon emission trading had effectively enhanced the total asset-liability ratio of enterprises, it concurrently diminished their valuation in the current capital market. Moreover, as we examine the case of China, the impact varied across regions. That is regions with stricter legal environments amplifying improvements in asset-liability ratios while looser regulatory contexts exacerbate declines in market valuation. Further investigation revealed that carbon emission trading had not spurred an increase in research and development (R&D) investments among the Chinese enterprises. At the same time they also noted that the participation in carbon trading had bolstered non-business income for involved enterprises, and its influence on investment income had proven insubstantial.[335] Comparative analyses with studies from the European Union and the United States suggested a trend aligning with the "uncertainty hypothesis."[336] This perspective posits that while carbon emission trading in China has imparted some financial benefits to enterprises, it falls short of fulfilling the optimistic predictions set forth by the Porter hypothesis, which anticipates enhanced competitiveness and innovation spurred by environmental regulations. As a conclusive remark to the situation while looking ahead with hopes for both sustainable goals as well as a trade arena that is not limited by environmental regulations, the ongoing developments in China's carbon market is supposed to enable enterprises to derive greater benefits through improved carbon

[331] ibid

[332] Graichen, V., Matthes, F.C., Mohr, L. and Schumacher, K., 2009. Impacts of the EU ETS on industrial competitiveness in Germany. *Institute for Applied Ecology, Bern*.

[333] Deng, H. (2024). Administration-Led Carbon Markets and China's Green Transition: Efficiency, Fairness and Rent-Seeking. Journal of Contemporary China, 1–16. https://doi.org/10.1080/10670564.2024.2367531 last accessed June 15, 2024

[334] Liu, M., Zhou, C., Lu, F. and Hu, X., 2021. Impact of the implementation of carbon emission trading on corporate financial performance: Evidence from listed companies in China. Plos one, 16(7), p.e0253460. last accessed June 15, 2024, https://doi.org/10.1371/journal.pone.0253460

[335] ibid

[336] Uncertain hypothesis test is a statistical tool that uses uncertainty theory to determine whether some hypotheses are correct or not based on observed data. As an application of an uncertain hypothesis test, this paper proposes a method to evaluate whether an uncertain differential equation fits the observed data or not.

emission management.[337] This expectation underscores the evolving landscape of carbon policy and its potential to shape economic outcomes while addressing environmental imperatives in the global context.

Economic Dynamics and Policy Implications of International Carbon Emissions Trading

The introduction of international permit trading deviates significantly from the standard environmental economics analysis due to several crucial factors. Specifically, when considering international permit trading, we must account for the impacts it has on nations or regions with economies that are far from the idealized perfectly competitive model.[338] Real-world economies are mostly characterized by the presence of taxes, monopoly power, externalities, and goods that are not traded internationally.[339] These factors collectively are known as economic distortions. Additionally, carbon policies can highly influence the terms of trade for these economies, and such impacts are external to the decisions made by private sellers and buyers of permits. We invoke the general theory of second best, as posited by Lipsey and Lancaster (1956),[340] alongside the international trade discourse on "immiserizing growth"[341] introduced by Bhagwati (1958)[342], to elucidate why the implementation of a permit trading system may not be universally advantageous for all nations under more comprehensive conditions. Trade economists will readily identify that immiserizing growth is predicated upon the existence of pre-existing economic distortions, while others might perceive this as a nuanced extension or application of the second-best theory. Nonetheless, the potential for emission permit trading to result in welfare diminishment under specific circumstances seems to have been insufficiently acknowledged in the environmental

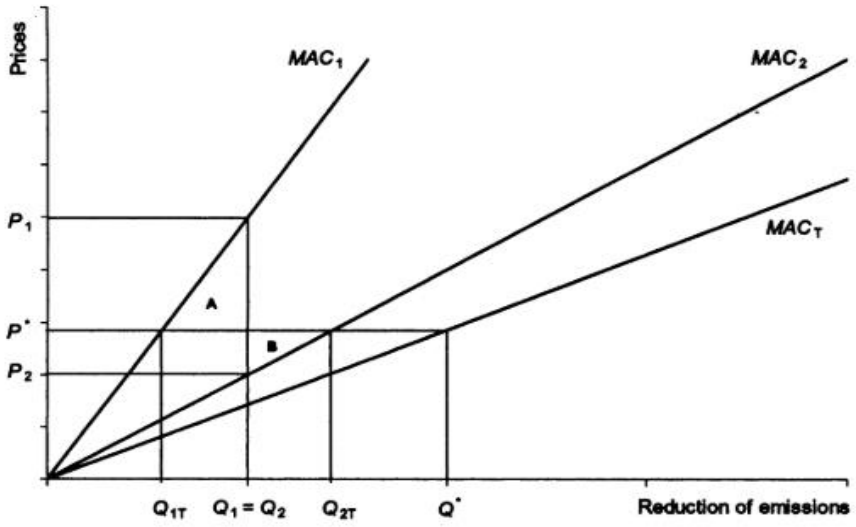
[337] Liu, M., Zhou, C., Lu, F. and Hu, X., 2021. Impact of the implementation of carbon emission trading on corporate financial performance: Evidence from listed companies in China. Plos one, 16(7), p.e0253460. last accessed June 15, 2024, https://doi.org/10.1371/journal.pone.0253460
Supra note 85.
[338] Babiker, Mustafa, et al. "Is International Emissions Trading Always Beneficial?" *The Energy Journal*, vol. 25, no. 2, 2004, pp. 33–56. *JSTOR*, http://www.jstor.org/stable/41323030. Accessed 14 June 2024.
[339] Scherer, F.M., 1994. *Competition policies for an integrated world economy*. Brookings Institution Press.
[340] Lipsey, R.G. and Lancaster, K., 1956. The general theory of second best. *The review of economic studies*, *24*(1), pp.11-32.
"He primary focus of the theory is what happens when the optimum conditions are not satisfied in an economic model. Lipsey and Lancaster's results have important implications for the understanding of not only trade policies but also many other government policies."
[341] The possibility of immiserizing growth has been expanded into a whole set of arguments.
regarding the effect of policymaking in developing countries. For example, it is recognized that trade.
liberalization, in the presence of foreign capital, may be immiserizing (Bhagwati, 1973, Bhagwati
and Tironi, 1980). Based on this logic, it is also affirmed that foreign aid and domestic capital
should be channeled away from the exporting sectors (e.g., agricultural, or mineral productions) into
industry (Bhagwati and Brecher, 1982)
[342] Pryor, F.L., 2007. Immiserizing growth as seen by Bhagwati, Samuelson, and others. *The Journal of Economic Education*, *38*(2), pp.208-214.

economics literature.[343] Furthermore, the empirical significance of this possibility remains largely unexplored in the context of carbon permit trading. As we speak of the Immiserizing growth theory propounded by Bhagwati in 1958, it may be applied to the context of international emissions trading. As we apply the theorem we find that, in a situation where countries meet their emissions targets through domestic measures, such as nationwide emissions trading systems which may be an ideal scenario without any distortions, this setup is less efficient compared to a system where emissions permits can be traded freely on an international scale.[344] However, due to imperfections in the emissions permit markets, some countries face higher marginal costs for reducing emissions compared to others.[345] Frankly speaking, this creates competitiveness effects, i.e. countries with lower abatement costs gain a competitive edge (or terms of trade gains) over countries with higher abatement costs.[346] When emissions permits are traded freely across borders, this cost advantage thus disappears. International emissions trading (IET) can become detrimental ("immiserizing") for a country that sells permits if the primary financial benefits from selling permits are overshadowed by the negative effects on its terms of trade.[347] In other words, the selling country's overall welfare could decline if the economic disadvantages caused by changes in trade terms outweigh the income gained from selling emission permits.[348] Based on the provided information, it is evident that international emissions trading can be advantageous for countries, particularly in specific contexts.[349] Explaining the various contexts and the differences it consists of the countries characterized by high marginal abatement costs[350] stand to benefit significantly from this system.[351] These nations, which encounter elevated costs to reduce emissions domestically, have the option to purchase permits from countries where abatement is more cost-effective. Consequently, they can meet their emission reduction targets at a lower cost compared to undertaking the reductions independently. Typically, developed countries with highly industrialized economies fall into this category, as they have often already implemented many of

[343] Ahlheim, M. and Schneider, F., 2002. Allowing for household preferences in emission trading–A contribution to the climate policy debate. *Environmental and Resource Economics*, *21*, pp.317-342.
[344] Supra note 15 read with expanded details in note 18.
[345] Woerdman, E., 2000. Competitive distortions in an international emissions trading market. *Mitigation and Adaptation Strategies for Global Change*, *5*, pp.337-360.
[346] Babiker, Mustafa, et al. "Is International Emissions Trading Always Beneficial?" The Energy Journal, vol. 25, no. 2, 2004, pp. 33–56. JSTOR, http://www.jstor.org/stable/41323030 . Accessed 14 June 2024.
[347] How do emissions trading systems work? - Grantham Research Institute on climate change and the environment. (2023, December 11). Grantham Research Institute on Climate Change and the Environment. https://www.lse.ac.uk/granthaminstitute/explainers/how-do-emissions-trading-systems-work/ last accessed June 15, 2024
[348] Atici, C., 2024. *Sustainable Development and International Food Trade Policies*. Taylor & Francis.
[349] Woerdman, E., 2000. Competitive distortions in an international emissions trading market. *Mitigation and Adaptation Strategies for Global Change*, *5*, pp.337-360.
[350] Moran, D., Macleod, M., Wall, E., Eory, V., McVittie, A., Barnes, A., Rees, R., Topp, C.F. and Moxey, A., 2011. Marginal abatement cost curves for UK agricultural greenhouse gas emissions. *Journal of Agricultural Economics*, *62*(1), pp.93-118.
"The abatement cost is simply the cost of an intervention that will reduce greenhouse gas emissions by one tonne."
[351] What You Need to Know About Abatement Costs and Decarbonization. (2023, April 21). World Bank. https://www.worldbank.org/en/news/feature/2023/04/20/what-you-need-to-know-about-abatement-costs-and-decarbonisation accessed 12 June 2024

the most accessible and least costly emissions reductions.[352] Conversely, countries with low marginal abatement costs also derive substantial benefits from international emissions trading.[353] These nations can sell their surplus permits to countries facing higher abatement costs. The financial revenue generated from selling permits can be allocated towards further emissions reductions, economic development, or other policy priorities.[354] Developing countries or those with more adaptable economies often exhibit lower marginal abatement costs because they can implement reductions more affordably or possess more opportunities for low-cost abatement. This implies that the general benefits of international emissions trading are manifold. Primarily, it enhances cost efficiency by facilitating emissions reductions in the most economical locations,[355] thereby minimizing the total expenditure required to achieve global emission reduction targets followed by the economic gains realized by countries that sell permits that can bolster their economic development and support further environmental initiatives.[356] Furthermore, the establishment of markets for emission permits incentivizes innovation in low-cost abatement technologies and practices. The figure below (Figure 4.2)[357] helps to comprehend the rationalized conclusion from the above concept that graphically demonstrates the cost-effectiveness of international emission trading in the absence of distortions is straightforward.

Figure 4.2 Cost Effectiveness of International Emissions Trading



[352] Chakravarty, S., Chikkatur, A., De Coninck, H., Pacala, S., Socolow, R. and Tavoni, M., 2009. Sharing global CO2 emission reductions among one billion high emitters. *Proceedings of the National Academy of Sciences*, *106*(29).
[353] Supra note 22.
[354] Jiang, J., Xie, D., Ye, B., Shen, B. and Chen, Z., 2016. Research on China's cap-and-trade carbon emission trading scheme: Overview and outlook. *Applied Energy*, *178*.
[355] Narassimhan, E., Gallagher, K.S., Koester, S. and Alejo, J.R., 2018. Carbon pricing in practice: A review of existing emissions trading systems. *Climate Policy*, *18*(8).
[356] ibid
[357] Babiker, Mustafa, et al. "Is International Emissions Trading Always Beneficial?" *The Energy Journal*, vol. 25, no. 2, 2004, pp. 33–56. *JSTOR*, http://www.jstor.org/stable/41323030. Accessed 14 June 2024.

In this scenario, the cost-effectiveness of emission trading becomes evident.[358] Country 1, with higher marginal abatement costs, can purchase permits from country 2, where abatement is cheaper. This allows both countries to meet their combined reduction target at a lower total cost, exemplifying the efficiency gains from international emission trading. However, several potential challenges must be acknowledged. Market imperfections can hinder the efficacy of emission permit markets,[359] as inefficiencies or distortions could diminish the potential benefits. Competitiveness effects may also arise, impacting the industries in different countries variably, especially where there are significant disparities in abatement costs.[360] Equity concerns present another challenge; the initial allocation of permits must be carefully designed to ensure fairness and political acceptability.[361]

As we speak about the Cost effectiveness involved in Emissions Trading (with respect to Carbon), it is necessary to highlight the role of, The Emissions Prediction and Policy Analysis (EPPA - EU model)[362]. Developed by the MIT Joint Program on the Science and Policy of Global Change and as explained by Babiker, Ellerman and Wing (2000), The EPPA - EU model, when applied to the analysis of the European Union Emissions Trading System (EU ETS), offers comprehensive insights into various aspects of carbon emissions trading (CET).[363] The model's conclusions underscore the cost-effectiveness of CET policy, highlighting it as an efficient mechanism for reducing greenhouse gas emissions. Additionally, by leveraging market forces to identify the most economical emission reduction opportunities, CET is known to minimize the overall cost of achieving emissions targets in comparison to traditional regulatory approaches.[364] Furthermore, the EPPA model demonstrates that CET enhances economic efficiency by creating financial incentives for companies to innovate and invest in cleaner technologies.[365] Firms capable of reducing emissions at lower costs can sell their surplus permits to those facing higher abatement costs, thereby fostering technological advancements and promoting cost savings.[366] The model also addresses the competitiveness of industries, noting that CET can impact sectors with high

[358] Supra note 32.
[359] Noll, R.G., 1982. Implementing marketable emissions permits. *The American economic review*, *72*(2).
[360] Verde, S.F., 2020. The impact of the EU emissions trading system on competitiveness and carbon leakage: the econometric evidence. *Journal of Economic Surveys*, *34*(2).
[361] ibid
[362] For description of the GTAP database see Hertel 1997
The latest version of the EPPA model is constructed using the GTAP4-E dataset, which offers a thorough representation of energy markets in physical units and detailed records of regional production and bilateral trade flows. The model uses 1995 as its base year and solves iteratively in 5-year increments. Comprehensive documentation of EPPA is available in the work by Babiker et al.
[363] Paltsev, S., Reilly, J.M., Jacoby, H.D., Eckaus, R.S., McFarland, J.R., Sarofim, M.C., Asadoorian, M.O. and Babiker, M.H., 2005. *The MIT emissions prediction and policy analysis (EPPA) model: version 4*. MIT joint program on the science and policy of global change.
[364] Babiker, M.H., Reilly, J.M., Mayer, M., Eckaus, R.S., Sue Wing, I., and Hyman, R.C., 2001. The MIT emissions prediction and policy analysis (EPPA) model: revisions, sensitivities, and comparisons of results.
[365] Jacoby, H.D., Reilly, J.M., McFarland, J.R. and Paltsev, S., 2006. Technology and technical change in the MIT EPPA model. *Energy Economics*, *28*(5-6), pp.610-631.
[366] ibid

energy consumption and emissions. However, it suggests that adverse effects on competitiveness can be mitigated through measures such as the free allocation of permits or the implementation of border carbon adjustments, thus preventing carbon leakage.[367]

As we dive further into the intricacies of the program and the analysis it has provided, in terms of the distributional impact, the EPPA model reveals that the costs and benefits of emissions trading are not uniformly distributed across sectors and regions.[368] This finding ultimately underscores the importance of policymakers in having the need to address these disparities to ensure fairness and equity in the implementation of CET, which may be at the end of the day a tumultuous task.[369] Additionally, the model concludes that CET can generate substantial revenue for governments through the auctioning of emissions permits.[370] This revenue can be allocated to further climate mitigation efforts, support affected industries and workers, or reduce other taxes, providing a dual benefit.[371] The model emphasizes the necessity of considering CET within the broader context of other climate and energy policies.[372] It concludes that CET is most effective when integrated with complementary policies, such as renewable energy incentives and energy efficiency measures, thereby enhancing overall environmental effectiveness and economic efficiency.[373] Indicating that the initiative may not thrive to stand alone but rather be more effective when seen as a collective and combined strategy.

Casting a look upon the long-term projections provided by the EPPA model indicate that CET can lead to significant emissions reductions over time,[374] contributing substantially to the achievement of international climate targets, such as those set by the Paris Agreement.[375] Additionally, the model's analysis highlights the varying impacts of CET across different sectors and regions, with energy-intensive industries and regions heavily reliant on fossil fuels facing greater challenges.[376] Conversely, regions with access to renewable energy resources stand to benefit more from the

[367] Winchester, N., Paltsev, S. and Reilly, J.M., 2011. Will border carbon adjustments work? *The BE Journal of Economic Analysis & Policy*, *11*(1).
[368] Morris, J., Farrell, J., Kheshgi, H., Thomann, H., Chen, H., Paltsev, S. and Herzog, H., 2019. Representing the costs of low-carbon power generation in multi-region multi-sector energy-economic models. *International Journal of Greenhouse Gas Control*, *87*, pp.170-187.
[369] Octaviano, C., Paltsev, S. and Gurgel, A.C., 2016. Climate change policy in Brazil and Mexico: Results from the MIT EPPA model. Energy Economics, 56.
[370] Babiker, Mustafa, et al. "Is International Emissions Trading Always Beneficial?" *The Energy Journal*, vol. 25, no. 2, 2004, pp. 33–56. *JSTOR*, http://www.jstor.org/stable/41323030. Accessed 14 June 2024
[371] ibid
[372] Cong, R.G., and Wei, Y.M., 2010. Potential impact of (CET) carbon emissions trading on China's power sector: A perspective from different allowance allocation options. *Energy*, *35*(9), pp.3921-3931.
[373] ibid
[374] Faehn, T., Bachner, G., Beach, R.H., Chateau, J., Fujimori, S., Ghosh, M., Hamdi-Cherif, M., Lanzi, E., Paltsev, S., Vandyck, T. and Cunha, B., 2020. Capturing key energy and emission trends in CGE models: Assessment of Status and Remaining Challenges.
[375] ibid
[376] Yahoo, M. and Othman, J., 2017. Employing a CGE model in analysing the environmental and economy-wide impacts of CO2 emission abatement policies in Malaysia. *Science of the total environment*, *584*, pp.234-243.

transition to a low-carbon economy.[377] A discussion that happens around this field involving the terms such as carbon, low emission, policy, benefit, transition, etc. is never complete unless the results that have happened over a period of time are derived and analyzed. It is at this point of intersection that we need to evaluate the complex dynamics of carbon pricing policies. We may do so by taking the scenario of carbon pricing policies within the EU, showing how different countries are affected differently by uniform carbon taxes versus EU-wide emission trading systems.[378] It highlights the challenges and trade-offs involved in achieving emissions reductions while minimizing economic welfare losses across a diverse set of member states.

Figure 4.3 - Welfare Effects of EU - Wide Emission Trading

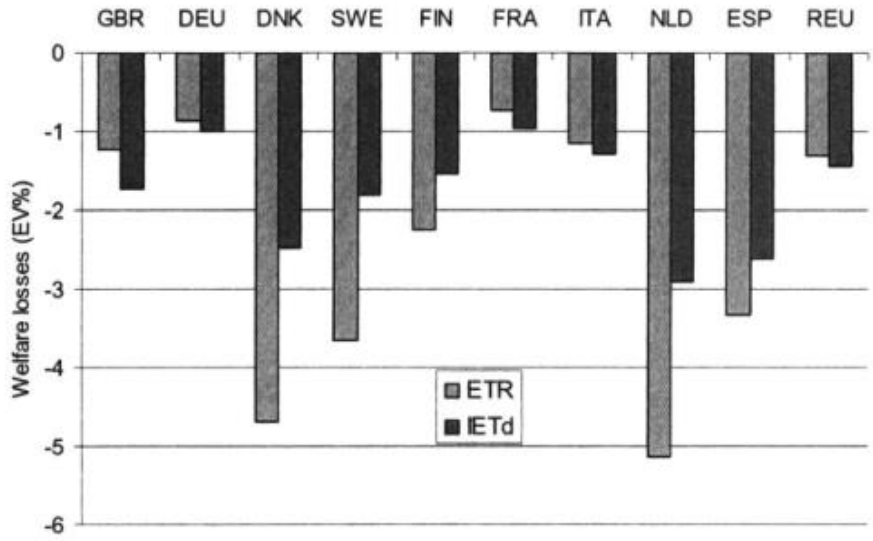
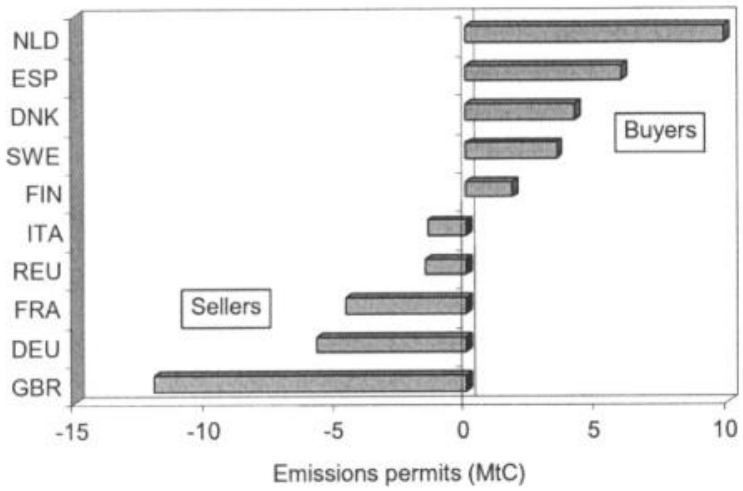


Figure 4.3 illustrates the welfare implications of the Kyoto constraints when applying a uniform carbon tax across each EU country (ETR case), as modeled by EPPA-EU. The welfare costs associated with the Kyoto constraints vary, ranging from approximately -0.7% in France to over -5% in the Netherlands. Additionally, the figure depicts the impact of implementing an EU-wide emission trading system in the context of existing energy taxes. According to the model, countries such as the Scandinavian nations and Spain, which predominantly import carbon permits, stand to

[377] ibid
[378] Egenhofer, C., Alessi, M., Georgiev, A. and Fujiwara, N., 2011. The EU Emissions Trading System and Climate Policy towards 2050: Real incentives to reduce emissions and drive innovation? *CEPS Special Reports*.
EU Emissions Trading System (EU ETS). (n.d.). Climate Action. https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en
Last accessed 15 June 2024

benefit from international trading. Conversely, countries like the United Kingdom, Germany, and France, which are primarily exporters of carbon permits, are projected to fare worse under trading conditions compared to scenarios without such trading mechanisms. While specific 2010-era classifications may have identified certain countries as primarily exporters of carbon permits, the current landscape[379] may show shifts in these roles due to ongoing policy developments and market dynamics within the EU ETS and other regional emissions trading systems. Keeping aside the shift in policy developments, yet a conclusive remark was derived, viz. - countries that import permits benefit from lower costs and potential economic gains.[380] In contrast, countries that export permits may experience welfare losses, possibly due to reduced competitiveness or negative economic impacts from higher permit prices. (Fig 4.4)

Figure 4.4 - EU - Wide Emissions Trading Market, IETd Case



[379] **Germany**: In recent years, Germany has often been a net importer of carbon permits. This reflects its efforts to comply with stricter emission reduction targets and transition towards cleaner energy sources as part of its Energiewende policy. Reports taken from BMU - Climate Protection and Energy and German Environment Agency - Emissions Trading

United Kingdom: Post-Brexit, the UK has developed its own emissions trading system (UK ETS), separate from the EU ETS. Its role as a net exporter or importer of permits would now depend on its domestic policies and market dynamics.

France: France's position has historically been more balanced, depending on its industrial and energy sector activities and specific policy measures.

Countries' roles in the carbon permit market can also shift in response to changes in national climate policies, international agreements (e.g., Paris Agreement), and technological advancements affecting emissions. (Authoritative sources such as the European Commission and National Environmental Agencies)

[380] Wilson, J.S., Mann, C.L. and Otsuki, T., 2004. Assessing the potential benefit of trade facilitation: A global perspective. *Available at SSRN 610266*.

From Fig. 4.4, we understand the trade positions of EU countries (2010 findings) within the carbon market under the IETd[381] scenario. The EPPA-EU model projected that 25 million tons of carbon (MtC) will be traded in the market by 2010, with an estimated carbon price of approximately $175 per ton of carbon (tC) within the EU bubble.[382] Countries such as the United Kingdom, Germany, France, Italy, and other European nations were anticipated to sell emission permits to the Netherlands, Spain, Denmark, Sweden, and Finland. A comparison of the welfare effects of international emission trading with trade positions revealed that permit-selling countries generally experienced negative impacts, whereas permit-buying countries benefited.[383] Let us take the example of a country that has had a drastic shift in policy, Germany. Germany is now, primarily a buyer of carbon permits within the EU Emissions Trading System (EU ETS).[384] This marks a shift from its earlier status as a major exporter of permits. Several factors contribute to this change, including increased domestic emissions reduction efforts and the overall tightening of the EU ETS cap on emissions. This transformation is indicative of broader trends within the EU, where countries like the Netherlands, Italy, and Poland have also become significant buyers of carbon permits due to their industrial activities and slower adoption of renewable energy compared to other EU members. [385]

Case Analysis: Germany's Transition in the EU ETS

Background and Context

The European Union Emissions Trading System (EU ETS) is a cornerstone of the EU's policy to combat climate change and is a key tool for reducing greenhouse gas emissions cost-effectively. Under this system, companies receive or buy emission permits, which they can trade with one another as needed. [386]

Germany's Initial Role as a Permit Exporter - In its initial phase, Germany held a prominent position as a major exporter of carbon permits within the EU Emissions Trading System (EU ETS).[387] This status was primarily attributable to Germany's advanced industrial infrastructure and

[381] IETd - International Emission Trading where emission permits can be traded across sectors within the European Union in the presence of preexisting distortion. (Babiker et al 2000)
[382] Gersbach, H. and Riekhof, M.C., 2021. Permit markets, carbon prices and the creation of innovation clusters. *Resource and Energy Economics*, *65*, p.101229.
[383] Nachtigall, D., Ellis, J., Peterson, S. and Thube, S., 2021. The economic and environmental benefits from international co-ordination on carbon pricing: Insights from economic modelling studies.
[384] Ellerman, A.D. and Buchner, B.K., 2007. The European Union emissions trading scheme: origins, allocation, and early results.
[385] Paterson, M., 2012. Who and what are carbon markets for? Politics and the development of climate policy. Climate Policy, 12(1).
[386] Rogge, K.S., Schneider, M., and Hoffmann, V.H., 2011. The innovation impact of the EU Emission Trading System—Findings of company case studies in the German power sector. *Ecological Economics*, *70*(3), pp.513-523.
[387] Matthes, F.C., 2017. Energy transition in Germany: a case study on a policy-driven structural change of the energy system. *Evolutionary and Institutional Economics Review*, *14*(1), pp.141-169.

early implementation of energy-efficient technologies. From 1990 to 2005, Germany successfully reduced its greenhouse gas emissions by approximately 18%. This significant reduction was a result of substantial technological advancements and improvements in energy efficiency. Consequently, Germany was able to generate a surplus of carbon permits, which it sold within the EU ETS framework (European Environment Agency, 2021).

Transition to a Permit Buyer - Germany's transition to becoming a net buyer of carbon permits can be attributed to several key factors. Despite ongoing efforts to reduce emissions, the country experienced a rise in greenhouse gas emissions due to high levels of industrial activity and energy demands.[388] In 2019, Germany's greenhouse gas emissions reached 805 million tonnes of CO_2 equivalent, which slightly exceeded its targeted emissions (European Environment Agency, 2021). Germany's ambitious energy transition policies,[389] known as Energiewende, aimed at phasing out coal and increasing reliance on renewable energy sources, encountered numerous challenges.[390] These included delays and significant costs, particularly associated with the phase-out of nuclear energy by 2022 and coal by 2038,[391] which temporarily increased reliance on fossil fuels (Federal Ministry for Economic Affairs and Climate Action, 2023). Additionally, the tightening of the EU ETS cap on emissions, which seeks to reduce emissions by 55% by 2030 compared to 1990 levels,[392] resulted in a decreased availability of permits. This overall tightening necessitated that Germany purchase additional permits to remain in compliance with EU regulations (European Commission, 2020).

Factors Contributing to the Shift - Several factors have contributed to Germany's shift from a permit exporter to a permit buyer. The decision to phase out coal, which is a significant but high-emission energy source, necessitated the immediate search for alternative energy solutions.[393] By 2020, coal's contribution to Germany's electricity generation had decreased to 24.8%, down from 35.3% in 2010 (Federal Statistical Office, 2021). Although the share of renewable energy sources in Germany's energy mix has been increasing, the adoption and integration rate into the national grid have been slower than required to offset emissions from traditional energy sources.[394] In 2020, renewable energy accounted for 45.4% of Germany’s electricity generation, a notable increase

[388] Graichen, V., Schumacher, K., Matthes, F.C., Mohr, L., Duscha, V., Schleich, J. and Diekmann, J., 2008. Impacts of the EU Emissions Trading Scheme on the industrial competitiveness in Germany.
[389] Hoffmann, V.H., 2007. Eu ets and investment decisions: The case of the german electricity industry. *European Management Journal*, *25*(6), pp.464-474.
[390] Pao-Yu, O., Brauers, H., Herpich, P., Hirschhausen, C.V., Prahl, A., Wehnert, T., Bierwirth, A., Fischedick, M., Kurwan, J., Mersmann, F. and Peters, A., 2019. Phasing out coal in the German energy sector: Interdependencies, challenges, and potential solutions.
[391] Mendelevitch, R., Kemfert, C., Oei, P.Y. and von Hirschhausen, C., 2018. The electricity mix in the European low-carbon transformation: coal, nuclear, and renewables. *Energiewende" Made in Germany" Low Carbon Electricity Sector Reform in the European Context*, pp.241-282.
[392] Pietzcker, R.C., Osorio, S. and Rodrigues, R., 2021. Tightening EU ETS targets in line with the European Green Deal: Impacts on the decarbonization of the EU power sector. *Applied Energy*.
[393] Supra note 141.
[394] Martinot, E., 2016. Grid integration of renewable energy: flexibility, innovation, and experience. *Annual Review of Environment and Resources*, *41*, pp.223-251.

from 20.2% in 2010 (Federal Statistical Office, 2021). Furthermore, Germany's robust industrial base continues to demand high energy inputs, leading to substantial emissions that need to be counterbalanced through the purchase of permits. [395]In 2020, the industrial sector alone contributed 22% of Germany's total greenhouse gas emissions (Federal Environment Agency, 2021). These combined factors have played a crucial role in transforming Germany's position within the EU ETS.

Factors Contributing to the Shift - The shift in Germany's energy policy and emission levels can be attributed to several key factors.[396] One significant factor was the decision to phase out coal, which, while being a major energy source, also contributed substantially to high emissions. In 2020, coal constituted 24.8% of Germany's electricity generation, a decrease from 35.3% in 2010, according to the Federal Statistical Office (2021). Despite efforts to increase the use of renewable energy sources, the adoption and integration of these sources into the national grid did not progress at a rate sufficient to compensate for the emissions from traditional energy sources. By 2020, renewables accounted for 45.4% of Germany's electricity generation, up from 20.2% in 2010, as reported by the Federal Statistical Office (2021). Additionally, Germany's robust industrial sector continued to have a high energy demand, contributing to emissions that needed to be offset through the purchase of permits. The industrial sector was responsible for 22% of Germany's total greenhouse gas emissions in 2020, according to the reports of the Federal Environment Agency (2021).

Comparative Analysis with Other EU Nations - Netherlands, Italy, and Poland: A comparative analysis of Germany with other EU nations such as the Netherlands, Italy, and Poland reveals similar trends in carbon permit purchases.[397] These countries, like Germany, have become significant buyers of carbon permits due to their substantial industrial activities and the slower adoption of renewable energy compared to other EU members.[398] For instance, Poland remains heavily dependent on coal, which accounted for 70% of its electricity generation in 2020, according to Eurostat (2021). This reliance on high-emission energy sources necessitates the acquisition of carbon permits to meet emission targets.[399]

Implications for Germany - The implications of Germany's energy and emission policies are multifaceted. [400]One significant impact is the economic cost associated with purchasing carbon permits. In 2020, the average price of EU ETS carbon permits was €24.70 per tonne of CO_2,

[395] Renn, O. and Marshall, J.P., 2020. History of the energy transition in Germany: from the 1950s to 2019. In The role of public participation in energy transitions (pp. 9-38). Academic Press.
[396] ibid
[397] Aszódi, A., Biró, B., Adorján, L., Dobos, Á.C., Illés, G., Tóth, N.K., Zagyi, D. and Zsiborás, Z.T., 2021. Comparative analysis of national energy strategies of 19 European countries in light of the green deal's objectives. *Energy Conversion and Management: X*, *12*.
[398] ibid
[399] Verma, Y.P. and Kumar, A., 2013. Potential impacts of emission concerned policies on power system operation with renewable energy sources. *International Journal of electrical power & energy systems*, *44*(1), pp.520-529.
[400] Supra note 142.

leading to considerable financial expenditures for Germany, as reported by the European Energy Exchange (2020). This financial burden places pressure on policymakers to expedite the adoption of renewable energy sources and enhance energy efficiency measures. Germany has set an ambitious target to increase the share of renewables in electricity consumption to 80% by 2030, according to the Federal Ministry for Economic Affairs and Climate Action (2023). Additionally, as a major economy, Germany's transition significantly influences market dynamics, potentially driving up permit prices and affecting other EU countries.

Explaining the Concept: Permit Buying vs. Permit Selling Nations

The theory posits that nations purchasing carbon permits are more likely to experience success or gain, whereas those selling permits tend to incur losses. This theory can be elucidated through several factors:

Economic and Environmental Gains for Permit Buyers: Nations that buy permits benefit from compliance and flexibility, as purchasing permits enables them to adhere to EU ETS regulations while retaining flexibility in their industrial and energy policies.[401] Additionally, the financial burden associated with buying permits serves as an impetus for investments in innovative technologies and renewable energy, resulting in long-term improvements[402] in efficiency and sustainability. Moreover, buying permits stimulates demand, which can lead to a more active and potentially profitable market for entities holding surplus permits.

Challenges for Permit Sellers: Conversely, selling permits yields immediate financial gains but may engender complacency in undertaking necessary structural changes to reduce emissions.[403] Over-reliance on permit sales poses economic risks, particularly if the market fluctuates or if the EU enforces stricter caps, thereby reducing permit availability.[404] Furthermore, countries selling permits might postpone essential investments in renewable energy and technology, leading to long-term sustainability issues and potential future costs.[405]

Germany's Case: Germany's transition from selling to buying permits exemplifies its proactive approach to addressing emissions, despite the associated costs.[406] By investing in renewable

[401] Gerbeti, A., 2021. Market mechanisms for reducing emissions and the introduction of a flexible consumption tax. *Global Journal of Flexible Systems Management*, *22*(Suppl 2), pp.161-178.
[402] Skjærseth, J.B. and Wettestad, J., 2008. Implementing EU emissions trading: success or failure? *International Environmental Agreements: Politics, Law, and Economics*, *8*, pp.275-290.
[403] Rehner, R. and McCauley, D., 2016. Security, justice, and the energy crossroads: Assessing the implications of the nuclear phase-out in Germany. *Energy Policy*, *88*, pp.289-298.
[404] Edwards, T.H. and Hutton, J.P., 2001. Allocation of carbon permits within a country: a general equilibrium analysis of the United Kingdom. *Energy Economics*, *23*(4), pp.371-386.
[405] ibid
[406] Böhringer, C., Hoffmann, T. and Manrique-de-Lara-Peñate, C., 2006. The efficiency costs of separating carbon markets under the EU emissions trading scheme: A quantitative assessment for Germany. *Energy Economics*, *28*(1), pp.44-61.

energy and phasing out coal, Germany is pursuing a long-term vision of environmental sustainability and economic resilience.[407] As a permit buyer, Germany exerts influence on the market, potentially driving up prices, which can further incentivize emission reductions throughout the EU. Thus, the case analysis wrt. Germany may be summarized as a shift from being a permit exporter to a permit buyer within the EU ETS exemplifying the intricacies and strategic deliberations nations encounter in their efforts to combat climate change.[408] The notion that nations purchasing permits are more likely to succeed aligns with Germany's long-term vision of sustainability and innovation.[409] Conversely, countries that depend on selling permits may encounter challenges if they fail to proactively pursue emission reduction and sustainability objectives.[410]

Canada's Experience in Emissions Trading and Related Legal Issues - International trade issues raised by GHG regulation.

The National Plan, as currently proposed by the Canadian national government, does not mention the possibility of introducing trade measures related to greenhouse gas (GHG) emissions.[411] Should the United States enact comprehensive GHG emission[412] reduction legislation, it is highly probable that such legislation will impose requirements on imports from countries that do not implement GHG emission reductions comparable to those of the United States. Incorporating GHG trade measures that align with U.S. efforts could be crucial for the successful implementation of a North American integrated GHG emission reduction regime. International trade agreements, such as the one establishing the World Trade Organization (WTO)[413] and the North American Free Trade Agreement (NAFTA), delineate rules regarding the imposition of border measures that affect imports from member countries. Canada's free trade agreements (FTAs) generally integrate the fundamental WTO rules that restrict the imposition of border measures on imports, as well as the principal exceptions to these rules. Key rules include:

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[407] Langhammer, R., Lechthaler, W., Reitz, S. and Tesfaselassie, M.F., 2022. *Germany Prioritizes the Long-term Goal of Sustainability over the Short-term Goal of Revitalizing the World Economy*. Istituto Affari Internazionali (IAI).
[408] ibid
[409] Supra note 154.
[410] Supra note 155, see Allocation of carbon permits within a country: a general equilibrium analysis of the United Kingdom. *Energy Economics*
[411] Freestone, D. and Streck, C. eds., 2009. *Legal aspects of carbon trading: Kyoto, Copenhagen, and beyond*. OUP Oxford.
Read chapter - V. Article 21 - Canada's Experience in Emissions Trading and Related Legal Issues
[412] The British Columbia government has established the Pacific Carbon Trust as a crown corporation with the mandate to acquire GHG offsets that meet British Columbia requirements. An initial June 2009 requirement of 35,000 tonnes of such offsets has been set.
[413] The Marrakech Agreement Establishing the World Trade Organization (signed 15 April 1994) 1867 UNTS 154, 33 ILM 1144 (WTO Agreement). The WTO Agreement and its various annexes constitute the governing law of the WTO. The 1947 General Agreement on Tariffs and Trade (GATT) is incorporated into an updated GATT 1994 along with other decisions and agreements adopted by the WTO parties; See General Agreement on Tariffs and Trade 1994 (signed 15 April 1994) 1867 UNTS 187, 33 ILM 1153 (GATT 1994)

1. **National Treatment:** This principle prohibits discrimination between imported and domestic goods.[414]
2. **Tariff Binding:** This rule prohibits the imposition of import fees that exceed the duty levels bound by an agreement.[415]
3. **Most-Favored Nation (MFN) Treatment:** This requires treaty parties not to discriminate between goods from different countries.[416]
4. **Prohibition on Quantitative Restrictions:** This includes bans on import and export quotas.[417]

These foundational principles apply in various ways to different policy options for GHG-related trade measures. For instance, a domestic carbon tax could potentially be implemented at the border concerning imports in a manner consistent with trade rules. However, the complexity and uncertainty involved in setting tariff rates, particularly when adjusting for countries with their GHG reduction measures, present significant challenges. Implementing a carbon tariff to support a domestic cap-and-trade regime raises more fundamental concerns regarding its legality under international trade rules,[418] as it does not involve an internal tax. Another approach to GHG-related trade measures may rely on specific exceptions in international trade treaties related to conservation. Notably, Article XX(g)[419] - The General Agreement on Tariffs and Trade (GATT) is significant in this regard, as it is referenced in both NAFTA and Canada's other FTAs.[420] According to this exception, measures relating to the conservation of exhaustible natural resources are exempt from Canada's primary international trade obligations, provided they are implemented alongside restrictions on domestic production or consumption. Given that this issue arises within the context of implementing a Canadian GHG-reduction regime, the "relating to conservation" criterion is arguably satisfied.[421] However, Article XX imposes additional constraints on utilizing this provision, including ensuring that the exempted measures do not constitute a disguised restriction on international trade.[422] Jurisprudence interprets this requirement to mean that the measure must be primarily aimed at conservation, related to the conservation of exhaustible natural resources, implemented in a manner that considers local conditions in exporting countries, and

[414] GATT 1994, Art III
[415] GATT 1994, Art II
[416] GATT 1994, Art I
[417] GATT 1994, Art XI
[418] Under WTO law, internal taxes are subject to the national treatment obligation in GATT Article III rather than the 'tariff binding' provisions of Article II that commit WTO members not to increase duties on imports beyond a 'bound' rate. WTO law allows internal taxes to be applied or enforced at the border with respect to imported goods.
[419] It is particularly significant that GATT, Art XX(g) has been incorporated by reference in NAFTA, Art 2101(1) and in Canada's other FTAs. ; GATT, Art XX(b) relating to measures 'necessary to protect human, animal, or plant life and health' may also be relevant, although the 'necessity' standard contained in this exception makes it more difficult to satisfy than the conservation-based exception in Art XX(g).
[420] Puig, G.V. and D DALKE, E.R.I.C., 2016. Nature and Enforceability of WTO-plus SPS and TBT Provisions in Canada's PTAs: From NAFTA to CETA. *World Trade Review*, *15*(1), pp.51-83.
[421] Dhar, B. and Das, K., 2009. The European Union's Proposed Carbon Equalization System: Can it be WTO Compatible? *Available at SSRN 1513231*.
[422] Lo, C.F., 2013. The proper interpretation of 'Disguised Restriction on International Trade'under the WTO: the need to look at the protective effect. *Journal of International Dispute Settlement*, *4*(1), pp.111-137.

applied even-handedly among trading partners. This conservation-related exception imposes strict parameters on the types of trade measures that can be applied to imports from countries without GHG-reduction commitments. The primary focus of the trade measure must be the avoidance of leakage rather than leveling the competitive playing field. While it may have the latter effect, that cannot be the sole lawful rationale for introducing import restrictions from countries lacking GHG reduction commitments. If a proposed measure is designed to address competitiveness in a manner unrelated to conservation, it may be deemed a disguised restriction on international trade and fail to qualify for the exception.[423] Also the failure to comply with international trade obligations can have serious ramifications,[424] regardless of the approach to trade issues ultimately adopted. The WTO Agreements and Canada's FTAs include dispute settlement mechanisms that allow Canada's trading partners to seek independent adjudication of allegations that a Canadian measure is inconsistent with trade rules.[425] If a complaining partner is successful, it can impose trade sanctions on Canadian exports. Given that many countries without GHG-reduction commitments are among the most dynamic export-driven economies, non-compliance with international trade rules could have severe economic and political consequences.

To sum it up, one may say that Canada's stance on carbon policy and trade relations involves navigating complex legal and policy challenges to integrate domestic climate goals with international trade obligations effectively. The country seeks to adopt measures that promote environmental sustainability while preserving its trade interests and relationships on the global stage.

Harmonizing Global Trade and Environmental Imperatives: Navigating the Intersection of WTO Frameworks and Climate Policy with a Focus on Carbon Emissions Trading (CET)

To this day, global efforts to promote trade and investment liberalization have evolved independently from initiatives aimed at mitigating global greenhouse gas emissions.[426] One framework is defined by the foundational treaties of the World Trade Organization (WTO) and its extensive network of over 3,000 regional and bilateral trade and investment agreements.[427] In contrast, the other framework is structured around the United Nations Framework Convention on

[423] See United States – Standards for Reformulated and Conventional Gasoline (29 April 1996), WT/DS2/AB/R; Shrimp–Turtle case.
See also Canada's Landing Requirement for Pacific Coast Salmon and Herring (16 October 1989) CDA-89-1807-01 (CUSFTA Panel Report interpreting GATT, Art XX(g) as incorporated in the 1989 Canada-US Free Trade Agreement)

[424] Yarbrough, B.V. and Yarbrough, R.M., 2014. *Cooperation and governance in international trade: The strategic organizational approach* (Vol. 133). Princeton University Press.

[425] de Mestral, A.C., 2013. Dispute settlement under the WTO and RTAs: an uneasy relationship. *Journal of International Economic Law*, *16*(4), pp.777-825.

[426] S Charnovitz, 'Trade and Climate: Potential Conflicts and Synergies' in Beyond Kyoto: Advancing the International Effort Against Climate Change (Pew Center: Arlington, 2003) at 141.

[427] Gehring, M.W. and Segger, M.C.C. eds., 2005. *Sustainable development in world trade law* (Vol. 9). Kluwer Law International BV.

Climate Change (UNFCCC), including its Kyoto Protocol and various associated international accords. Despite both systems sharing a common objective of sustainable development, their interaction remains intricate and multifaceted.[428] International trade and investment treaties also play a significant role in influencing the implementation and effectiveness of new climate change regulations.[429] Just as trade and investment rules can shape climate policies, climate regulations themselves have an impact on trade and investment policies.[430] While climate laws and policies may impose restrictions on specific economic activities, it is undoubtedly true that they can also create incentives for new forms of development.[431] Indeed, many measures designed to address climate change can be viewed as regulatory frameworks governing trade and investment.[432] Which is exactly why emerging policies and regulations are being implemented to establish Emissions Trading Schemes (ETS) aimed at reducing greenhouse gas emissions and promoting investment in sustainable, low-carbon development.[433] Significant distinctions exist between international frameworks that govern trade and investment-related barriers imposed by states, international rules that incentivize states to trade emission certificates and invest in low-carbon development,[434] and domestic measures encouraging firms to trade Emission Reduction Units (ERUs) or even develop renewable energy technologies. Nonetheless, the legal rules overseeing international emissions trading and investment in clean development should be considered integral to the broader body of evolving trade and investment law. Similar to how many trade provisions within the WTO Agreements contribute to the WTO's sustainable development objectives,[435] the specialized trade and investment provisions in the 1992 UN Framework Convention on Climate Change (UNFCCC) advance the sustainable development goals of the global climate regime. For example, an ETS can create financial incentives for firms to develop and adopt innovative technologies by capping emissions and creating a market for emission reduction units.[436] In certain contexts, an ETS might even help incentivize the transfer of sustainable development technologies to developing countries, such as through Emission Rights Purchase Agreements (ERPA)[437] that facilitate such transfers in relation to Clean Development Mechanism (CDM) certificates, which is of huge importance. More broadly, the innovative and coherent design of future trade, investment, and climate change regulations, underpinned by thorough legal analysis can significantly contribute to sustainable

[428] ibid
[429] 5 C Voigt, Sustainable Development as a Principle of International Law–Resolving Conflicts between Climate Measures and WTO Law (Martinus Nijhoff: Leiden, 2009)
[430] Gao, J., Gao, F., Yin, B. and Zhang, M., 2021. International trade as a double-edged sword: The perspective of carbon emissions. *Frontiers in Energy Research*.
[431] ibid
[432] Veel, P.E., 2009. Carbon tariffs and the WTO: An evaluation of feasible policies. *Journal of International Economic Law*, *12*(3).
[433] Dong, Y. and Whalley, J., 2010. Carbon, trade policy and carbon free trade areas. *The World Economy*, *33*(9).
[434] Branger, F. and Quirion, P., 2014. Climate policy and the 'carbon haven effect.' *Wiley Interdisciplinary Reviews: Climate Change*, *5*(1)
[435] Sampson, G.P., 2021. The WTO, Trade Agreements, and Sustainable Trade. *asia policy*, *16*(4), pp.7-21.
[436] Narassimhan, E., Gallagher, K.S., Koester, S. and Alejo, J.R., 2018. Carbon pricing in practice: A review of existing emissions trading systems. *Climate Policy*, *18*(8), pp.967-991.
[437] Kuen, S., Analysis of Clean Development Mechanism Transactions from a Law, and Economics Perspective.

development.[438] This can be substantiated by recent data signifying the growing importance of ETS in driving emissions reductions and fostering technological innovation as depicted by the ICAP and various other reports. According to the International Carbon Action Partnership (ICAP) 2023 report, global carbon markets have expanded, with the value of carbon trading reaching approximately $272 billion in 2022, reflecting an increasing commitment to climate action and sustainable development. This expansion highlights the potential for ETS to integrate with international trade and investment policies, promoting a more comprehensive approach to global sustainability efforts, which is exactly our objective.

The advantages of trade liberalization are not inherently granted to a state and its citizens; rather, these benefits are acquired through the negotiation of treaties.[439] Within the frameworks of the World Trade Organization (WTO) and numerous regional trade agreements, States have committed to reducing tariffs and ensuring non-discrimination in the form of most-favored-nation (MFN) status for trading partners.[440] Fundamentally, four principal obligations underpin the global trade law regime,[441] aiming to enhance stability and minimize costs for enterprises across all State Parties involved in trade agreements. Furthermore, these treaty rules have implications for the formulation of new laws aimed at reducing greenhouse gas (GHG) emissions and promoting low-carbon investments. As we take a look into the earlier stages we find that states have undertaken to transform various non-tariff barriers to trade, such as quotas, into more quantifiable tariffs.[442] This involves a reciprocal commitment to adhere to specific tariff schedules and engage in ongoing negotiations to lower these rates.[443] The primary obligations of WTO members are delineated in individual detailed Country Schedules annexed to the General Agreement on Tariffs and Trade (GATT) for goods, and the General Agreement on Trade in Services (GATS)[444] for services. GATT rules are applicable to all goods unless explicitly reserved or excepted, whereas GATS employs a 'positive list' approach, covering only the services listed by WTO Members.[445] These schedules provide exhaustive listings of all products for which a WTO member has committed to binding tariffs at specified levels. Each WTO member maintains a 'schedule of concessions,'

[438] Leal-Arcas, R., 2021. *Climate clubs for a sustainable future: the role of international trade and investment law*. Kluwer Law International BV.
[439] Werksman, J., 1999. Greenhouse gas emissions trading and the WTO. *Rev. Eur. Comp. & Int'l Envtl. L.*, *8*, p.251.
[440] Odio, A.M., 2020. The most favoured nation and non-discrimination provisions in international trade law and the OECD codes of liberalisation.
[441] Gehring, M.W., Segger, M.C.C., de Andrade Correa, F., Reynaud, P., Harrington, A. and Mella, R., 2013. Climate change and sustainable energy measures in regional trade agreements (RTAs). *International Centre for Trade and Sustainable Development, Geneva*.
[442] Ray, E.J., 1987. Changing patterns of protectionism: The fall in tariffs and the rise in non-tariff barriers. *Nw. J. Int'l L. & Bus.*, *8*, p.285.
[443] Hoda, A., 2018. *Tariff Negotiations and Renegotiations under the GATT and the WTO: Procedures and Practices*. Cambridge University Press.
[444] General Agreement on Trade in Services (adopted 15 April 1994, entered into force 1 January 1995) 1869 UNTS 183.
[445] Muller, G., 2014. Trade Agreements and Legal Services: An Anatomy of the GATS and Preferential Trade Arrangements. *Global Trade and Customs Journal*, *9*(5).

essentially detailing the tariff rates imposed on imported goods.[446] By binding a tariff in their schedule, members ensure that their customs tariff on the specified product will not exceed the bound rate. Although members are not mandated under WTO law to reduce their bound tariff rates, they are obligated to continue negotiations to bind additional product lines and lower tariffs on already bound lines.[447] It is in fact the duty of the WTO Committee on Trade in Goods and the Committee on Trade in Services to oversee the adequate implementation of these rules.[448] This commitment to non-discriminatory market access can at times restrict the types of regulations that states may adopt, impacting their ability to selectively limit certain imports.[449] For instance, Article XI:1 of the GATT, which prohibits quantitative restrictions, has been instrumental in evaluating the GATT-consistency of natural resource and environment-related bans,[450] as seen in the US – Tuna and US – Shrimp cases.

Secondly, members commit further to extending MFN status to each other, thereby preventing discrimination in the treatment of goods, services, and investments from different economic partners.[451] Additionally, members commit to granting 'national treatment' to other members for goods, specific services, and other aspects of their trade policy.[452] This commitment prevents WTO members from treating 'like products' from other members differently and prohibits distinctions based on the process and production methods (PPMs) used.[453] These rules regulate the types of health, environmental, natural resource management, consumer safety, and other standards that WTO members may apply to products, barring exceptions.[454] The MFN and national treatment commitments are also enforced through the WTO Agreement on Technical Barriers to Trade (TBT Agreement), which addresses technical regulations and standards, and the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement),[455] which addresses health and plant safety regulations and standards. These agreements define permissible trade restrictions,

[446] Bartels, L. and Häberli, C., 2010. Binding tariff preferences for developing countries under article II GATT. *Journal of International Economic Law*, *13*(4), pp.969-995.
[447] Gehring, Hepburn and Cordonier Segger, see above note 58.
[448] Chaisse, J. and Matsushita, M., 2013. Maintaining the WTO's supremacy in the international trade order: a proposal to refine and revise the role of the trade policy review mechanism. *Journal of International Economic Law*, *16*(1), pp.9-36.
[449] Ibid, M Trebilcock and R Howse, Regulation of International Trade (Routledge: New York, 2005) 336.
[450] LEIF, D.B., 2022. Environmental Related Disputes on Trade Issues in GATT and WTO from 1982-2002. *International Journal of Advanced Engineering Research and Science*, *9*, p.2.;
Gehring, M.W., Segger, M.C.C. and Hepburn, J., 2012. Climate change and international trade and investment law. In *International Law in the Era of Climate Change*. Edward Elgar Publishing.
[451] Mattoo, A., 2000, October. MFN and the GATS. In *Regulatory Barriers and the Principle of Non-Discrimination in World Trade Law: Past, Present and Future, The World Trade Forum* (Vol. 2).
[452] Supra note 199.
[453] Likeness is determined by the dispute settlement mechanism in the WTO on a case-by-case basis, taking into account criteria such as 'the product's end-uses in a given market; consumers' tastes and habits, which change from country to country; the product's properties, nature and quality' (Report of the Working Party on Border Tax Adjustments, BISD 18S/97, para 18)
[454] There is a growing opinion which argues that in the GATT the same rules as in the TBT should be in force permitting PPMs to be taken into account under certain conditions.
[455] Agreement on the Application of Sanitary and Phytosanitary Measures (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 493.

aiming to curtail protectionism that unfairly favors domestic firms over foreign competitors.[456] For example, the SPS Agreement provides specific restrictions on the types of phytosanitary standards that governments should adopt, influencing the relevant GATT rules and exceptions.[457] The WTO TBT and SPS Committees examine and debate these issues, offering temporary exceptions to developing countries based on their financial, trade, and developmental needs.[458] Furthermore, WTO members are obligated to protect intellectual property rights through the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs Agreement), regulate subsidies through the WTO Agreement on Subsidies and Countervailing Measures (Subsidies Agreement),[459] manage government procurement through the WTO Agreement on Government Procurement,[460] and oversee investment measures related to trade in goods through the Agreement on Trade-Related Investment Measures (TRIMs).[461] These obligations may influence governmental efforts to regulate climate change. For instance, the TRIPs Agreement mandates the establishment of laws to protect intellectual property rights, potentially affecting technology transfer.[462] The Subsidies Agreement restricts the types of subsidies WTO members can provide, which may impact incentives for emission reduction. Although the WTO Government Procurement Agreement and TRIMs are minimalist accords, as governments were reluctant to adopt significant restrictions in these areas, the TRIMs disciplines apply solely to measures affecting trade in goods, requiring notification of specific trade-related investment measures that discriminate against foreign entities. Which implies that if stricter regulations are adopted in government procurement or investment, they could constrain public purchasing schemes for lower-carbon products or climate regulations affecting foreign investors.[463]

Thirdly, members mutually agree to transparency and notification obligations, along with binding, peaceful dispute resolution mechanisms.[464] The WTO's Dispute Settlement Understanding (DSU)

[456] M Echols, Food Safety, and the WTO: The Interplay of Science, Culture and Technology (Kluwer Law Int: The Hague, 2001), C Button, The Power to Protect: Trade, Health, and Uncertainty in the WTO (Hart Publishing: Oxford, 2004) 43–90

[457] See WTO's Documents Online database using document symbol G/SPS/GEN for all documents of the SPS Committee, including those related to exceptions for developing countries.

[458] Zleptnig, S., 2009. Non-economic objectives in WTO law: justification provisions of GATT, GATS, SPS and TBT agreements. In *Non-Economic Objectives in WTO Law*. Brill Nijhoff.

[459] Agreement on Subsidies and Countervailing Measures (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 14

[460] 5 Agreement on Government Procurement (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 194.

[461] 6 Agreement on Trade-Related Investment Measures (adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 186.

[462] Helfer, L.R., 2004. Regime shifting: the TRIPs agreement and new dynamics of international intellectual property lawmaking. *Yale J. Int'l L., 29*.

[463] Molino, J., 2019. Sustainable public procurement in the Green Climate Fund: a "walk-the-talk" strategy on climate change." *Public Procurement Law Review*, (4), pp.154-174.

[464] Cossy, M. and Marceau, G., 2009. Institutional challenges to enhance policy coordination: How WTO rules could be utilised to meet climate objectives. *T. Cottier, O. Natrova and SZ Bigdeli, International Trade Regulation and the Mitigation of Climate Change, CUP*.

aims to provide security and predictability to the multilateral trading system.[465] WTO members resolve disputes through consultation and other mechanisms, but if these efforts fail, disputes can be submitted to adjudication by a Panel, with appeals to an Appellate Body. If the losing party fails to implement the decision, the Dispute Settlement Body can authorize retaliation, such as the suspension of trade concessions like preferential tariffs. The WTO Agreements include exceptions for measures related to sustainable development.[466] Notably, Article XX of the GATT[467] permits WTO members to violate WTO disciplines under specific circumstances, such as for the protection of health, the environment, or the conservation of exhaustible natural resources. Article XX stipulates that such measures should not constitute arbitrary or unjustifiable discrimination between countries where the same conditions prevail, nor should they be a disguised restriction on international trade.[468] Similar exceptions exist in the GATS and the TRIPs Agreement. The GATT Article XX is one crucial safeguard for a State's ability to regulate its laws to tune for sustainable development.[469] However, once a trade law violation is established, the burden to justify environmental and social measures falls upon the WTO member invoking the exception. Article XX exceptions have been tested in various WTO disputes related to issues highlighted in Agenda 21 and the Johannesburg Plan of Implementation.[470] Examples may include claims concerning genetically modified organisms (EC – Approval and Marketing of Biotech Products), enforcement of domestic IP laws (Denmark – Measures Affecting the Enforcement of Intellectual Property Rights), marine animal protection laws (US – Shrimp/Turtle)[471], domestic legislation (US – Section 211 Appropriations Act),[472] carcinogenic asbestos regulation (European Communities – Measures Affecting Asbestos and Products Containing Asbestos),[473] and waste management

[465] Understanding on Rules and Procedures Governing the Settlement of Disputes (adopted 15 April 1994, entered into force 1 January 1995) 1869 UNTS 401, (DSU) Art 3.2.

[466] 2 DFAIT, Retrospective Analysis of the 1994 Canadian Environmental Review – Uruguay Round of Multilateral Trade Negotiations (DFAIT: Ottawa 1999).

[467] Ibragimov, Z. I. (2023). Article XX of the Gatt 1994 and WTO Members: Sufficient Freedom to Define and Pursue Environmental Policy Objectives. Acta Prosperitatis, 14(1). https://doi.org/10.37804/1691-6077-2023-14-80-86 last accessed June 15, 2024

"Providing free trade conditions to all WTO Members, the GATT 1994 includes general exceptions to Article XX, which allows members to adopt trade and legislative restrictions and measures to promote values and interests and the protection of the environment. Driven by the aim of protecting the environment, various countries have been adopting a considerable number of measures to protect the environment and all human, animal and plant life and health under their jurisdiction. However, such restrictions are likely to influence the free trade regime through a clash of interests and relationships between WTO Members, which are challenged through WTO dispute settlement mechanisms. Although the WTO provides exceptions under Article XX of its free trade conditions to protect the environment via the national environmental measures of WTO Members, the justifications for such measures are challenged in meeting the requirements of Article XX."

[468] Gaines, S., 2001. The WTO's reading of the GATT Article XX chapeau: a disguised restriction on environmental measures. *U. Pa. J. Int'l Econ. L.*, *22*, p.739.

[469] Voigt, C. ed., 2009. *Sustainable development as a principle of international law: resolving conflicts between climate measures and WTO law* (Vol. 2). Brill.

[470] Agenda 21; online: accessed 14 June 2024; Johannesburg Plan of Implementation (JPOI), Report of the World Summit on Sustainable Development, Johannesburg UN Doc A/CONF.199/20.

[471] 7 WTO, United States – Import Prohibition of Certain Shrimp and Shrimp Products (12 October 1998) WT/DS58/AB/R.

[472] WTO, United States – Section 211 Omnibus Appropriations Act of 1998 (1 February 2002) WT/DS17/AB/R

[473] EC – Measures Affecting Asbestos and Asbestos – Containing Products (12 March 2001) WT/ DS135/AB/R.

(Brazil – Measures Affecting Imports of Retreaded Tyres)[474]. These cases have yielded mixed results, with the trade dispute settlement body generally prioritizing trade law obligations.[475] A further systemic exception acknowledges non-reciprocal special and differential treatment for developing countries, and Article XXIV:5 of the GATT allows WTO members to exclude customs unions and bilateral or regional free trade areas from compliance with WTO disciplines under certain conditions.[476] These regional agreements are significant as they establish disciplines that might influence the adoption of domestic and international carbon regulations and measures to promote sustainable development and environmental cooperation.[477] With the environment - trade relation drawn out to comprehend the scenario at hand better we understand how the same can be effectively initiated in terms of a carbon policy.[478] One where environmental protection and trade regulation meets a common point.

Recent data highlights that global trade reached approximately $32 trillion in 2022, underscoring the importance of robust trade agreements in facilitating economic growth and development (World Trade Organization, 2023). Furthermore, climate-related trade measures have become increasingly pertinent, with the International Energy Agency (IEA) reporting that investments in clean energy technologies exceeded $1.3 trillion in 2022, reflecting a growing intersection between trade policy and environmental sustainability. These statistics underscore the dynamic interplay between trade liberalization, economic policy, and sustainable development in contemporary global governance. Over the years, the European Union Emissions Trading System (EU ETS) has acted as a nearly ideal model, one that may have its flaws but yet a significant initiative to achieve the goals and has imparted several pivotal insights to policymakers on constructing an emissions trading framework that balances cost-efficiency with environmental efficacy. These insights are equally pertinent for policymakers contemplating the review or establishment of analogous emissions trading regimes at federal, sub-federal, or regional levels.[479] A significant takeaway is the necessity for harmonized rules and procedures to mitigate internal market distortions. Detailed and uniform guidelines for emission monitoring, reporting, and verification are crucial in compiling precise and dependable data, which is essential for cap-setting and allowance allocation.[480] This uniformity helps prevent the risk of over-allocation as we have discussed before. Central to achieving overall emission reduction targets is the centralized determination of an

[474] 0 WTO, Brazil: Measures affecting Imports of Retreaded Tyres – Report of the Panel (12 June 2007) WT/DS332/R
[475] GATT, Art X; GATS, Art III; TRIPs Art 63; Agreement on Technical Barriers to Trade (adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 120, Art 10; Agreement on the Application of Sanitary and Phytosanitary Measures (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 493 Agreement, Art 7.
[476] WTO, Denmark – Measures Affecting the Enforcement of Intellectual Property Rights (21 May 1997) WT/DS83/1.
[477] 1979 'Enabling Clause' decision of the GATT Contracting Parties, see European Communities - Conditions for the Granting of Tariff Preferences to Developing Countries (7 April 2004) WT/ DS246/AB/R
[478] 2 Bartels and Ortino, Regional Trade Agreements and the WTO Legal System (OUP: Oxford, 2007) 3.
[479] Mehling, M.A., 2016. Legal frameworks for linking national emissions trading systems. *The Oxford handbook of international climate change law*, pp.257-85.
[480] Cao, M., 2020. A case study on China's carbon emission trading system: experiences and recommendations. *Asia Pacific Journal of Environmental Law*, *23*(2).

overarching emissions cap, coupled with a transparent, standardized process for its gradual reduction over time.[481] This approach creates market scarcity, thereby providing operators and installations within covered sectors with ample planning reliability. Which simply means this approach intentionally limits the supply of certain goods or services in the market, resulting in increased demand and higher prices.[482] By doing so, it gives businesses and facilities within the regulated sectors a clear and predictable framework, allowing them to plan their operations and investments with greater certainty. Additionally, the centralized allocation of allowances, governed by stringent, uniform criteria, ensures equitable treatment across all covered sectors, operators, and installations. This in turn minimizes the potential for national or state-level biases Auctioning has emerged as one of the most preferred allocation methods, embodying the "polluter pays" principle with high regard.[483] It incentivizes early domestic investments in energy efficiency and renewable energy while minimizing windfall profits. However, limited exceptions are necessary to address concerns about carbon leakage.[484]

Expanding the coverage of an emissions trading scheme to include a broader range of sectors and activities enhances market liquidity and stabilizes price volatility. However, the inclusion of small emitters may not be cost-effective, and emissions trading might not be suitable for certain sectors, such as private households and transportation.[485] Yet another aspect is the strong and determined compliance and enforcement mechanisms, including penalty sanctions, are imperative to maintain the scheme's environmental integrity. Strong enforcement ensures that all participants adhere to the established rules and regulations, thereby preventing any undermining of the system's objectives.[486] Penalty sanctions play a pivotal role in this context, acting as a deterrent against non-compliance.[487] By imposing significant penalties on violators, the scheme ensures that participants are incentivized to comply with emission reduction targets and other requirements. This rigorous approach helps to uphold the credibility and effectiveness of the scheme in achieving its environmental goals.[488] Furthermore, linking emissions trading schemes is essential for augmenting market liquidity, reducing price volatility, and minimizing the risk of market distortions between similar installations within and outside the scheme's jurisdiction. The importation of Clean Development Mechanism (CDM) and Joint Implementation (JI) credits is

[481] Flachsland, C., Marschinski, R. and Edenhofer, O., 2009. Global trading versus linking: Architectures for international emissions trading. *Energy Policy*, *37*(5)
[482] Hobbs, J.E., 1996. A transaction cost approach to supply chain management. *Supply Chain Management: An International Journal*, *1*(2), pp.15-27.
[483] Huber, B.R., 2013. How did rggi do it: Political economy and emissions auctions. *Ecology LQ*, *40*, p.59.; Baldwin, R., Cave, M. and Lodge, M., 2011. *Understanding regulation: theory, strategy, and practice*. Oxford university press.
[484] Aldy, J.E. and Stavins, R.N., 2012. The promise and problems of pricing carbon: Theory and experience. *The Journal of Environment & Development*, *21*(2), pp.152-180.
[485] Zhang, X. and Wang, Y., 2017. How to reduce household carbon emissions: A review of experience and policy design considerations. *Energy Policy*, *102*, pp.116-124.
[486] Arjoon, S., 2006. Striking a balance between rules and principles-based approaches for effective governance: A risks-based approach. *Journal of Business Ethics*, *68*(1), pp.53-82.
[487] Van der Merwe, T.D., 2018. *The Carbon Tax as a Market-based Enforcement Mechanism to Ensure Compliance with Environmental Law and Address Pollution* (Doctoral dissertation).
[488] ibid

vital for ensuring cost-effectiveness. However, an unrestricted import of these credits could inflate the overall emissions cap, depress allowance prices, and dissuade investments in domestic climate mitigation measures. [489]The issue is that, if a nation permits the unrestricted importation of emission credits, several adverse outcomes may materialize.

Firstly, the overall cap on emissions would become less stringent, leading to an increase in the total allowable emissions.[490] This scenario would undermine the primary objective of reducing greenhouse gas emissions, thereby jeopardizing environmental integrity.
Secondly, the influx of imported credits would result in an oversupply of emission allowances. This oversupply would depress allowance prices, making it economically easier for companies to continue polluting.[491] Consequently, the reduced financial pressure would disincentivize companies from undertaking significant efforts to curtail their emissions and invest in cleaner technologies.[492] Furthermore, when the cost of allowances decreases, companies lose the financial impetus to invest in domestic climate mitigation measures. This could include investments in renewable energy projects or enhancements in energy efficiency. The resultant lack of investment would decelerate the nation's transition to a low-carbon economy. According to recent studies, such a trend can have profound implications for technological innovation in the clean energy sector. For instance, the 2022 report by the International Energy Agency highlighted that consistent investment in domestic renewable energy is crucial for achieving the goals set in the Paris Agreement. The unrestricted import of emission credits could significantly undermine a country's climate change mitigation efforts.[493] Such a practice is likely to slow technological advancements in the clean energy sector, ultimately compromising the integrity and effectiveness of the emissions trading scheme. This scenario might result in the nation failing to meet both its national and international climate targets. The repercussions could include environmental degradation, economic setbacks, and a tarnished international reputation. For instance, the European Union's Emissions Trading System (EU ETS) has demonstrated that maintaining stringent controls on emission credits is essential for reducing emissions and fostering innovation in green technologies.[494] Hence, the unrestricted importation of emission credits presents a substantial risk to the overarching goals of sustainable development and climate resilience[495]. Moreover, it is essential to recognize that emissions trading is merely one facet of a comprehensive climate policy.

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[489] ibid
[490] McAllister, L.K., 2009. The overallocation problem in cap-and-trade: Moving toward stringency. *Colum. J. Envtl. L.*, *34*, p.395.
[491] Dormady, N.C. and Englander, G., 2016. Carbon allowances and the demand for offsets: a comprehensive assessment of imperfect substitutes. *Journal of Public Policy*, *36*(1), pp.139-167.
[492] Corral, C.M., 2003. Sustainable production and consumption systems—cooperation for change: assessing and simulating the willingness of the firm to adopt/develop cleaner technologies. The case of the In-Bond industry in northern Mexico. Journal of cleaner production, 11(4), pp.411-426.
[493] Harrison Jr, D., Klevnas, P., Nichols, A.L. and Radov, D., 2008. Using emissions trading to combat climate change: programs and key issues. *Envtl. L. Rep. News & Analysis*, *38*.
[494] Vlachou, A., 2014. The European Union's emissions trading system. *Cambridge Journal of Economics*, *38*(1), pp.127-152.
[495] ibid

It must be supplemented by additional policy instruments to effectively address the multifaceted challenges of climate change. Recent data underscores the EU ETS's impact, noting that in 2020, emissions from installations covered by the system fell by 13.3% compared to the previous year, driven largely by a significant reduction in emissions from the power sector. This highlights the system's potential for facilitating substantial emissions reductions, reinforcing the importance of incorporating these learned lessons into future policy designs.

In addition to the direct environmental and economic implications, the distribution of emissions allowances for free within international trade frameworks raises complex legal issues under World Trade Organization (WTO) anti-dumping rules.[496] This practice may provoke challenges from trading partners, potentially leading to the imposition of anti-dumping duties (ADDs) on imports perceived as unfairly priced due to the receipt of free emissions allowances by producers. Anti-dumping rules traditionally define dumping as the export price of a product being lower than its normal value in the exporting country's domestic market or compared to similar exports to third countries.[497] However, the allocation of emissions allowances for free complicates this definition, as it alters the cost structure of exported goods without necessarily reflecting abnormal pricing practices. Thus, while stringent controls on emission credits are necessary to drive down emissions and foster green innovation, policymakers must also navigate the intricate legal landscape of international trade. Addressing these challenges requires a nuanced approach that balances environmental goals with adherence to international trade regulations, ensuring that climate policies are both effective and compliant with global trade norms. Under Article 2.2 of the Anti-Dumping Agreement,[498] which addresses situations where comparisons with domestic market prices are not feasible due to particular market conditions, arguments could potentially be made regarding the distortionary effects of free emissions allowances on production costs.[499] The absence of emissions costs may artificially deflate the export prices of goods, thereby distorting their normal value compared to products originating from countries where allowances are auctioned.[500] This disparity could form the basis for claims of dumping under WTO rules, similar to past cases involving discrepancies in energy costs affecting production expenses and export prices. Nevertheless, the viability of any measure adopted would depend on demonstrating that the

[496] Holzer, K., 2016. WTO law issues of emissions trading.

[497] Van Vaerenbergh, P., 2023. WTO Rules for Greening Trade Remedies. In Greening Trade Remedies: Environmental Considerations in the Law and Practice of WTO Trade Remedies (pp. 25-48). Cham: Springer Nature Switzerland.

[498] "When there are no sales of the like product in the ordinary course of trade in the domestic market of the exporting country or when, because of the particular market situation or the low volume of the sales in the domestic market of the exporting country2, such sales do not permit a proper comparison, the margin of dumping shall be determined by comparison with a comparable price of the like product. when exported to an appropriate third country, provided that this price is representative, or with the cost? of production in the country of origin plus a reasonable amount for administrative, selling, and general costs and for profits."

[499] Weishaar, S., 2007. CO 2 emission allowance allocation mechanisms, allocative efficiency, and the environment: a static and dynamic perspective. *European Journal of Law and Economics*, *24*, pp.29-70.

[500] Wu, L., 2021. How can carbon trading price distortion be corrected? An empirical study from China's carbon trading pilot markets. *Environmental Science and Pollution Research*, *28*(46).

cost differentials significantly create a distortion in production costs and export prices, to the detriment of importing countries' industries.[501] As global trade dynamics increasingly intersect with environmental policies like emissions trading systems (ETS), the potential for disputes over fair competition and cost distortions is likely to grow, necessitating careful legal scrutiny and potentially paving the way for new interpretations within WTO frameworks. Therefore we may say that while WTO anti-dumping rules traditionally focus on price disparities rooted in market conditions, the emergence of emissions allowances as a factor influencing production costs and export prices introduces new complexities.[502] The prospect of using ADDs to address perceived unfair advantages from free emissions allocations underscores evolving challenges at the intersection of trade and environmental policies, inviting future legal and policy debates within international trade forums.

Carbon Emission Trading and Welfare: Addressing the Multifaceted Challenges in Policy and Practice

This paper explores the proposition that international permit trading is almost always welfare-enhancing, a common assertion in climate change literature. However, it addresses criticisms that, although economically efficient, permit trading may not equitably distribute revenue within societies and can induce negative effects in other markets due to large resource transfers.[503] We have examined scenarios where permit trading can result in welfare losses due to general equilibrium effects in countries with pre-existing distortions.[504] The analysis shows that emissions trading can be welfare-decreasing for countries exporting permits when the efficiency costs associated with pre-existing distortionary taxes exceed the primary gains from trading. This situation is particularly relevant in the European Union, where energy markets are highly distorted and countries are heavily dependent on trade. The interaction between pre-existing energy taxes and the Kyoto regime can lead to high distortions and deadweight losses, making an EU-wide emissions trading regime disadvantageous for permit-exporting countries. A critical aspect of the analysis is that existing energy taxes are viewed as pure distortions, which may not optimally correct externalities.[505] This implies that a carbon emissions trading system could worsen welfare in the EU. For instance, In the California Chamber of Commerce v. California Air Resources Board (2017)[506] case, the California Court of Appeal upheld the legality of California's cap-and-trade

[501] Krueger, A.O., 1984. Trade policies in developing countries. *Handbook of international economics*, *1*, pp.519-569.
[502] Jegou, I. and Rubini, L., 2010. The allocation of emission allowances free of charge: legal and economic considerations. *ICTSD Global Platform on Climate Change, Trade Policies and Sustainable Energy*, (14).
[503] Tietenberg, T., 2002. The tradable permits approach to protecting the commons: What have we learned? *Available at SSRN 315500*.
[504] See Babiker, Mustafa, et al. "Is International Emissions Trading Always Beneficial?" *The Energy Journal*, vol. 25, no. 2, 2004, pp. 33–56. *JSTOR*, http://www.jstor.org/stable/41323030. Accessed 14 June 2024
[505] Bhattacharyya, S.C., 1996. Energy taxation and environmental externalities: a critical analysis. *J. Energy & Dev.*, *22*, p.199.
[506] Cal. Chamber of Commerce v. State Air Resources Bd. (2017), California Court of Appeal - Cal. Chamber of Commerce v. State Air Resources Bd.

program, rejecting claims that auctioning carbon allowances was an unconstitutional tax. The EC's proposal to limit trading to energy companies and energy-intensive industries, thereby excluding more distorted sectors, is considered a good approach. Alternatively, allowing domestic trading among legal entities while restricting international trading to national governments could reflect social costs more accurately.[507]

The first best solution ideally involves addressing existing distortions, yet practical challenges emerge when this proves unfeasible. For instance, international permit trading, while theoretically beneficial, may result in welfare losses for certain countries without a supportive coalition driven by economic incentives.[508] This underscores the political complexities of sustaining such systems. The intricacies of pre-existing distortions and terms of trade necessitate careful examination under specific circumstances to predict their effects accurately. In Europe, for example, meeting Kyoto targets hinges on effective implementation of EU-wide trading regimes and equitable burden distribution across sectors, especially in energy and agriculture.[509] Therefore, proposing effective greenhouse gas mitigation solutions demands cautious analysis and consideration. Despite heightened global attention to carbon markets under the Paris Agreement, the interface between climate finance and trade policy remains significantly underdeveloped.[510] This neglect persists despite recognition within stakeholder circles of Article 6's potential to unlock substantial climate finance resources. This gap is particularly critical for developing nations, notably in Africa where the majority of Least Developed Countries (LDCs) are concentrated.[511] Leveraging climate finance is viewed as pivotal for these countries' sustainable development aspirations. Several unresolved issues concerning carbon markets loomed large as the COP28 summit of the UNFCCC drew close.[512] These include unresolved matters regarding market coverage, the inclusion of carbon removals, and the necessity for robust governance frameworks to prevent the double counting of emissions reductions, ensuring broader environmental integrity. The framework established by Article 6 of the Paris Agreement holds promise for LDCs, presenting new opportunities in carbon

[507] Abbott, K.W., 1985. The Trading Nation's Dilemma: The Functions of the Law of International Trade. *Harv. Int'l. LJ*, *26*.

[508] Carbone, J.C., Helm, C., and Rutherford, T.F., 2009. The case for international emission trade in the absence of cooperative climate policy. *Journal of environmental economics and management*, *58*(3), pp.266-280.

[509] Anderson, J., 2007. Climate and energy policy in Europe. *Intereconomics*, *42*(2), pp.84-90.

[510] Michaelowa, A., 2012. Carbon markets or climate finance. *Low carbon and adaptation investment choices for the developing world*.

[511] Boyle, M., 2021. National Development Identities in the Self-Differentiated Paris Climate Agreement: Implications for Multi-scalar Climate Governance.

[512] Sayed, T. E., Levy, C., Mannion, P., Pacthod, D., Rahi, J., & Sullivan, R. (2023, December 21). Outcomes from COP28: What next to accelerate climate action? McKinsey & Company. https://www.mckinsey.com/capabilities/sustainability/our-insights/outcomes-from-cop28-what-next-to-accelerate-climate-action last accessed 16 June 2024

"Negotiations at COP28 concluded with the "UAE Consensus". One notable element of which was the agreement on a global "transition away from fossil fuels in energy systems, in a just, orderly, and equitable manner, accelerating action in this critical decade, to achieve net zero by 2050 in keeping with the science." This is the first time that fossil fuels have been collectively mentioned in a COP agreement, although there was a commitment to "phase down unabated coal power" at COP26.";

trade that could bolster climate finance initiatives.[513] However, significant barriers, both technical and financial, must be surmounted to fully realize these prospects. Despite their integral role in the Paris Agreement and global climate policy, international carbon markets have not been accorded commensurate attention in multilateral trade policy discussions.[514] This oversight contrasts starkly with the defensive stance adopted by the international trade policy community, particularly in anticipation of forthcoming border carbon adjustment measures by the EU. The current discourse lacks a comprehensive focus on international carbon markets. One honest finding is that there is a pressing need for heightened scrutiny of advancements within international carbon markets.[515] Developing domestic emissions trading schemes, for instance, not only offers a potential strategy to mitigate border carbon adjustments but also facilitates greater ambition in emission reduction efforts. Crucially, these markets hold the potential to mobilize significant revenue for financing sustainable development and fostering the transition to green economies, particularly vital for LDCs and other developing nations. Efforts to promote sovereign carbon markets under Article 6 of the Paris Agreement are poised to augment climate finance streams, notably through levies on carbon market transactions earmarked for adaptation purposes. This marks a substantial increase from previous mechanisms,[516] underscoring their importance in supporting climate-resilient development. Issues pertinent to Small Island Developing States (SIDS), which are particularly vulnerable to climate impacts, necessitate intensified attention.[517] The Africa Carbon Markets Initiative, initiated during COP27, aims to generate substantial carbon credits annually, potentially unlocking billions in revenue and creating millions of jobs by 2030. Similarly, regional collaborations like the West African Alliance on Carbon Markets and Climate Finance (WAACMCF) exemplify concerted efforts to capitalize on carbon markets for technology transfer and result-based climate finance.[518] Recent agreements, such as that between Switzerland and Ghana on transferred mitigation outcomes, highlight innovative approaches to emissions reduction that span international boundaries. Such initiatives demonstrate the potential for bilateral cooperation to achieve global climate targets. As we laid all our hope and faith in finalizing UNFCCC methodologies under Article 6[519] at COP28, this year - 2024, it once again turned out to

[513] Bhattacharya, A., Songwe, V., Soubeyran, E. and Stern, N., 2023. A climate finance framework: decisive action to deliver on the Paris Agreement–Summary. *Second report of the Independent High-Level Expert Group on Climate Finance. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science*.

[514] Stephan, B. and Lane, R. eds., 2015. *The politics of carbon markets*. Abingdon, England: Routledge.

[515] Watt, R., 2017. *The moral economy of carbon offsetting: ethics, power, and the search for legitimacy in a new market*. The University of Manchester (United Kingdom).

[516] LOPEZ-CLAROS, A.U.G.U.S.T.O., 2021. Financing Instruments for Climate Change Mitigation and Adaptation.

[517] Thomas, A., Baptiste, A., Martyr-Koller, R., Pringle, P. and Rhiney, K., 2020. Climate change and small island developing states. *Annual Review of Environment and Resources*, *45*, pp.1-27.

[518] Bergis, H., Betts, G., Binet, R., Bird, P., Bover-Cid, S., Cantergiani, F., Coroller, L., den Besten, H.M.W., Desriac, N., Ellouze, M. and Goffredo, E., 2023. P3-160 Challenge tests to study inactivation potential and kinetic parameters (ISO 20976-2: 2022). In *IAFP Annual Meeting Abstracts* (pp. 281-281).

[519] "Article 6 of the Paris Agreement allows countries to voluntarily cooperate with each other to achieve emission reduction targets set out in their NDCs. This means that, under Article 6, a country (or countries) will be able to transfer carbon credits earned from the reduction of GHG emissions to help one or more countries meet climate targets. Within Article 6, Article 6.2 creates the basis for trading in GHG emission reductions (or "mitigation outcomes")

cause distress and disappointment.[520] At COP28, held in Dubai, negotiations aimed at establishing new rules for a United Nations-run system allowing countries and companies to trade carbon emissions offsets failed to reach a consensus. The European Union, Mexico, and the Latin American Ailac bloc rejected a proposed deal due to concerns over the standards for approving offset projects. [521]The United States and a majority of countries supported the deal but faced opposition from those seeking stricter rules aligned with higher standards like those of the EU's emissions trading system. As a result, carbon trading under the Paris Agreement's provisions remains stalled, with negotiations set to resume in 2024 for potential agreement at COP29 in 2025. The absence of substantial discourse on carbon markets within the WTO reflects ongoing finalization of the Paris Agreement's regulatory framework. Nonetheless, there is a compelling case for enhancing the alignment between carbon markets, climate finance, and trade policy, particularly as NDCs increasingly integrate trade-related considerations. Our priority areas include integrating WTO principles on market access into carbon market frameworks, with emphasis on non-discrimination and national treatment. Special provisions for market access aimed at SIDS and LDCs, given their heightened vulnerability to climate impacts, underscore the need for targeted support and facilitation of new carbon trading opportunities. This may necessitate redefined roles for aid for trade mechanisms and technology transfer initiatives. Reflecting on outcomes from the Africa Climate Summit underscores the imperative of galvanizing support for sovereign carbon markets in line with Paris Agreement objectives. Central to this endeavor is the urgent mobilization of climate finance, particularly directed towards adaptation efforts in vulnerable regions.

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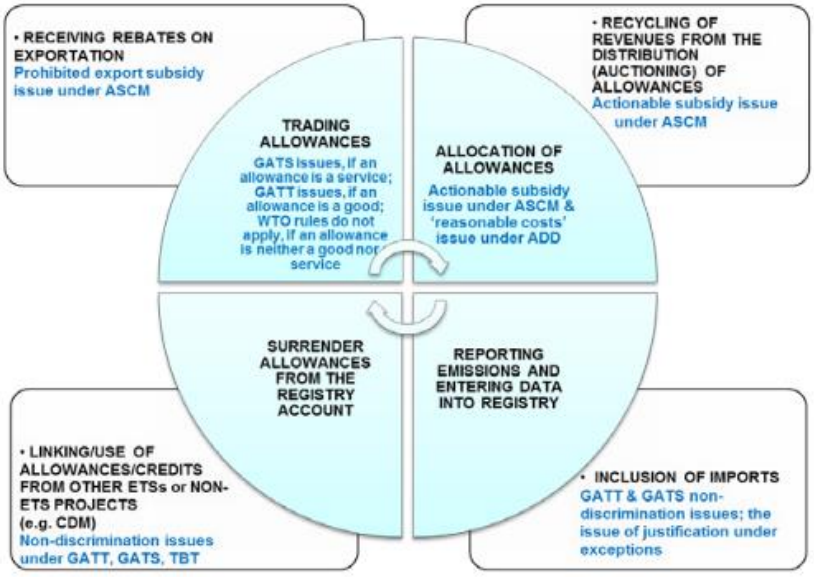
across countries. Article 6.4 is expected to be similar to the Clean Development Mechanism of the Kyoto Protocol. It establishes a mechanism for trading GHG emission reductions between countries under the supervision of the Conference of Parties – the decision-making body of the UN Framework Convention on Climate Change. Article 6.8 recognizes non-market approaches to promote mitigation and adaptation. It introduces cooperation through finance, technology transfer, and capacity building, where no trading of emission reductions is involved."

[520] See, COP28 kicks carbon trading down the road as EU blocks deal - By Jake Spring, Kate Abnett and Sarah Mcfarlane
https://www.reuters.com/markets/carbon/cop28-kicks-carbon-trading-down-road-eu-blocks-deal-2023-12-13/ last accessed 16 June 2024 - "DUBAI, Dec 13 (Reuters) - U.N. climate talks failed on Wednesday to seal a deal on new rules which would allow the launch of a central system for countries and companies to begin offsetting their carbon emissions and trading those offsets.The European Union, Mexico and the Latin American Ailac bloc rejected a proposed deal, negotiated over two weeks at COP28, which would have set key rules for approving offset projects in a centralized United Nations-run system, two negotiators inside the closed-door technical talks told Reuters."
"The U.S. and European Union have been at loggerheads" on the issue, said Dirk Forrister, president and CEO of the International Emissions Trading Association."
"This is certainly a setback for carbon markets," said Lina Barrera of Conservation International.
"Those interested in participating in the market won't know what to expect, slowing the whole process of getting a market off the ground," Barrera said.

[521] ibid

Figure 4.5 - ETS design and its Elements



From the above figure (Fig 4.5), we can comprehend that WTO compliance remains a pivotal consideration in the discourse surrounding the design elements of an Emissions Trading System (ETS). Although considerable research has been dedicated to this area, predicting with certainty the outcome of WTO scrutiny on an ETS is challenging. This uncertainty stems from several factors. Firstly, the design of an ETS is not uniform and varies significantly across different schemes.[522] Secondly, issues related to ETSs have yet to be adjudicated in WTO disputes, leaving their compliance with WTO rules untested. Among the design measures of an ETS, certain elements appear more likely to face challenges under WTO law. These include the free allocation of emissions allowances, the recycling of ETS revenues to domestic producers, the inclusion of imports within an ETS, and the provision of emissions allowance rebates upon exportation.[523] These elements raise issues under the General Agreement on Tariffs and Trade (GATT) non-discrimination rules and the Agreement on Subsidies and Countervailing Measures (ASCM) disciplines on subsidies. Consequently, the availability of exceptions for justifying these measures is of paramount importance. Furthermore, we must understand that WTO rules are pertinent in the context of international emissions trading, where national ETSs are linked through the mutual recognition of emissions allowances.[524] This linkage ensures that allowances issued in one

[522] Tang, L., Wu, J., Yu, L. and Bao, Q., 2017. Carbon allowance auction design of China's emissions trading scheme: A multi-agent-based approach. *Energy Policy*, *102*, pp.30-40.
[523] ibid
[524] Mehling, M.A., 2016. Legal frameworks for linking national emissions trading systems. *The Oxford handbook of international climate change law*, pp.257-85.

jurisdiction are accepted for compliance under an ETS in another jurisdiction. Establishing common design features for ETSs across different countries and achieving compatibility among them presents a significant challenge for ETS linking arrangements. WTO law would apply to the terms of mutual recognition of emissions allowances of different origins, ensuring that the conditions for acceptance do not adversely affect the competitive relationship between domestic and foreign producers or service suppliers.[525] Recent development emphasizes the complexity of these issues. For instance, the European Union has been taking initiative in refining its ETS to ensure alignment with WTO rules. The EU's efforts include rigorous monitoring and reporting guidelines to enhance transparency and compliance. In 2021, the EU ETS saw a record 30% reduction in emissions from the power sector, highlighting the system's effectiveness but also its evolving nature in response to international trade and environmental policies.

Considering yet another study conducted by the Beijing Postdoctoral Research Foundation under the 'Key Projects of the National Social Science Foundation'[526] we find that in trying to closely analyze the interface that lies between the carbon policy and the trade implications it might reap, there could be several conclusions that can be drawn. First, the spatial correlation analysis discussed by Gao and Zhang suggests a significant positive spatial dependence between international trade and carbon emissions.[527] The spatial econometric model results indicate that foreign trade exerts a positive spatial spillover effect on the carbon emissions of countries with comparable levels of local development, thereby promoting carbon emissions to some extent. The threshold effect regression results demonstrate that the impact of foreign trade on carbon emissions exhibits a noticeable dual-threshold effect relative to economic development levels. This delineates three distinct threshold intervals corresponding to different stages of economic development.[528] Additionally, the heterogeneity test results highlight how foreign trade influences carbon emissions across various regions and time periods can be highly variable by nature. The spatial spillover effect, characterized by differences in regional and temporal patterns, indicates distinct stages, dynamics, and ongoing trends in these impacts.

International trade is highly critical for economic development, which certainly cannot be denied. Yet carbon emission reduction is equally imperative. Consequently, investigating the interplay between international trade and economic development, along with the corresponding effects, holds significant value for long-term sustainability. For instance, the recent trade conflict between China and the United States has led to a reduction in carbon emissions, with China reducing its emissions by approximately 36.21 to 40.32 million tons, and the United States reducing its

[525] Jegou, I. and Rubini, L., 2010. The allocation of emission allowances free of charge: legal and economic considerations. *ICTSD Global Platform on Climate Change, Trade Policies and Sustainable Energy*, (14).
[526] Gao, J., Gao, F., Yin, B. and Zhang, M., 2021. International trade as a double-edged sword: The perspective of carbon emissions. *Frontiers in Energy Research*, *9*.
[527] Zhong, Z., Zhang, X. and Gao, W., 2020. Spatiotemporal evolution of global greenhouse gas emissions transferring via trade: Influencing factors and policy implications. *International Journal of Environmental Research and Public Health*, *17*(14), p.5065.
[528] ibid

emissions by 2.15 to 3.15 million tons. However, this reduction in emissions may be offset by increases in other countries (Zhang et al., 2021).

Current research primarily views the relationship between international trade and carbon emissions from two perspectives: one posits that international trade increases carbon emissions, while the other suggests it reduces them. Studies adopting different perspectives, variables, and methodologies can yield contradictory results. For example, international trade between China and the United States has led to emissions issues, as global shipping generates 938 million tons of carbon emissions annually (Lin et al., 2014; Liu et al., 2019; Zhang et al., 2017).[529] In contrast, Kazakhstan can develop green energy to achieve a green economy (Wang X et al., 2019), and China can enhance agricultural technology to mitigate poor energy use (Jiang et al., 2020). Dietzenbacher et al. (2020) proposed accounting methods to encourage countries to formulate effective energy policies related to international trade, establishing a reward and punishment system as a useful approach to achieve these goals.[530] High-income countries benefit from low-carbon industries and develop leading low-carbon technologies and management practices, leveraging their technological, financial, and environmental awareness advantages to contribute to carbon reduction (Qin, 2020). Thus, international trade acts as a double-edged sword impacting carbon emissions, necessitating further scholarly examination of this relationship.[531] Policy implications derived from this study are manifold. First, it is essential to promote the low-carbon transformation of foreign trade strategies tailored to the specific conditions of different countries. Countries should formulate differentiated strategies in line with the threshold effect of economic development while maintaining the current development trajectory. Strengthening environmental supervision alongside the expansion of foreign trade is crucial.[532] For instance, supporting mandatory corporate social responsibility information disclosure can facilitate green technological innovation, ultimately achieving a balance between economic growth and environmental sustainability.[533] Countries in the initial threshold should leverage their specific strengths to enhance GDP rather than rely solely on international trade, as in this stage, international trade exacerbates carbon emissions.[534] For those in the intermediate threshold, a balance between industrial development and carbon emission prevention is necessary. Countries in the advanced threshold should focus on identifying sustainable green development methods.

Second, international coordination must be strengthened, urging developed countries to assume

[529] Liu, H., Meng, Z.H., Lv, Z.F., Wang, X.T., Deng, F.Y., Liu, Y., Zhang, Y.N., Shi, M.S., Zhang, Q., and He, K.B., 2019. Emissions and health impacts from global shipping embodied in US–China bilateral trade. *Nature Sustainability*, *2*(11).

[530] Bhattarai, U., Maraseni, T. and Apan, A., 2022. Assay of renewable energy transition: A systematic literature review. *Science of The Total Environment*, *833*, p.155159.

[531] Liu, G.G. and Qin, X. eds., 2023. *Global health and development: Low-carbon economy and health innovation*. Springer Nature.

[532] Esty, D.C., 1994. *Greening the GATT: trade, environment, and the future*. Peterson Institute.

[533] Feng, Y., Wang, X. and Liang, Z., 2021. How does environmental information disclosure affect economic development and haze pollution in Chinese cities? The mediating role of green technology innovation. *Science of the total environment*, *775*

[534] Copeland, B.R., 2012. International trade and green growth. *World Bank Policy Research Working Paper*, (6235).

greater responsibilities in trade.[535] The impact of carbon dioxide on the climate is universally detrimental. Given the disparity in output and energy efficiency, carbon emissions for identical products produced in different countries can vary significantly. The production-consumption trade model, where production occurs in low-income countries and consumption in high-income countries, is associated with high carbon emissions. Therefore, developed nations should provide financial and technical support to developing countries to enhance their overall energy efficiency and reduce emissions.[536]

Finally, it is imperative to monitor the evolving relationship between international trade and carbon emissions and adjust policies accordingly. This requires relevant authorities to remain cognizant of the trends in international trade and carbon emissions. Different countries should adopt specific measures to reduce carbon emissions without hampering international trade.[537] For example, China has focused on establishing new transitional policies to mitigate carbon emissions effectively.[538] Overall, the intricate relationship between international trade and carbon emissions necessitates comprehensive research and tailored policy responses to foster sustainable economic development while mitigating environmental impacts.

To wrap up, we may view the concept from a holistic approach and may summarize in essence that, while the design of an ETS is crucial for its efficacy in mitigating climate change, it must also navigate the intricate landscape of international trade regulations. Ensuring that ETS design elements are compliant with WTO rules is essential for maintaining a fair and competitive global trading system while achieving environmental objectives. This balancing act requires continuous adaptation and alignment with both environmental goals and international trade norms.

[535] Wade, R.H., 2003. What strategies are viable for developing countries today? The World Trade Organization and the shrinking of 'development space.' *Review of international political economy*, *10*(4), pp.621-644.
[536] Ishikawa, J., Kiyono, K. & Yomogida, M. Is Emission Trading Beneficial? JER 63, 185–203 (2012). https://doi.org/10.1111/j.1468-5876.2012.0057
[537] Balogh, J.M. and Mizik, T., 2021. Trade–climate nexus: A systematic review of the literature. *Economies*, *9*(3), p.99.
[538] Shetty, R. (2024, June 5). China's Energy Intensity and Carbon Intensity Targets Are All but Unachievable. The Diplomat. https://thediplomat.com/2024/06/chinas-energy-intensity-and-carbon-intensity-targets-are-all-but-unachievable/ last accessed 16 June 2024

CHAPTER 5:
FINDINGS AND POLICY RECOMMENDATIONS

Challenges in Structuring and Governing Carbon Credit Markets in India

While a carbon credit market can effectively incentivize the reduction of net carbon emissions and enhance the cost-effectiveness of such reductions, the government faces several critical challenges in structuring and governing this market. The foremost challenge pertains to the monitoring and oversight of carbon credits. Carbon credit projects, often widespread and situated in remote locations, present significant difficulties for governing bodies attempting to maintain effective oversight. Reliance on information provided by project developers poses a conflict of interest, given their vested interest in maximizing their credits. Additionally, third-party verification agencies, which are intended to offer unbiased assessments, may not consistently provide reliable or trustworthy evaluations.[539] Ensuring the integrity and reliability of these third-party verifiers is crucial, yet challenging, due to the inherent complexity and variability of carbon offset projects.

Another pivotal issue with carbon offsets, one that continues to challenge international markets, is the concept of additionality. Additionally, it refers to the principle that carbon credits should be awarded solely for emission reductions or avoidances that would not have occurred in the absence of the carbon credit system. In practice, determining additionality can be both complex and subjective. For example, if solar power becomes more economically viable than coal power in India, a company might naturally transition from coal to solar for economic reasons. This scenario raises the question of whether such a company should receive carbon credits for the emissions avoided by this transition, considering that the switch is driven by cost savings rather than a direct intent to reduce emissions. Awarding carbon credits in such cases could undermine the credibility and effectiveness of the carbon market by granting credits for actions that do not genuinely represent additional emission reductions.[540]

Addressing these challenges necessitates the establishment of robust regulatory frameworks, stringent verification processes, and transparent governance mechanisms. These measures are essential to ensure that the carbon credit market functions effectively and credibly, ultimately

[539] Cgep, C. (2024, May 13). *Lessons for Structuring India's Carbon Market to Support a Cost-Efficient Energy Transition*. Center on Global Energy Policy at Columbia University SIPA | CGEP. https://www.energypolicy.columbia.edu/publications/lessons-for-structuring-indias-carbon-market-to-support-a-cost-efficient-energy-transition/ last accessed 12 June 2024

[540] L, J. (2024, February 23). *India Revises Its Carbon Credit Trading Scheme for Voluntary Players*. Carbon Credits. https://carboncredits.com/india-revises-its-carbon-credit-trading-scheme-for-voluntary-players/ last accessed 12 June 2024

leading to authentic reductions in carbon emissions. Additionality is a fundamental principle in carbon credit markets, stipulating that carbon credits should be awarded exclusively for emission reductions that would not have occurred in the absence of the carbon credit market's incentives. The primary objective of carbon credits is to stimulate activities that lead to specific reductions or avoidances in emissions. If a project achieves emission reductions independently of the carbon credit incentive, awarding credits for such a project fails to deliver the intended environmental benefits. Consider a scenario involving a company in India that currently relies on coal power. Should solar power become more economically viable than coal power, the company might transition to solar energy purely based on cost savings, regardless of any carbon credit incentives. In assessing additionality, one must distinguish between non-additional and additional cases. In a non-additional case, if the company transitions to solar power solely because it is more cost-effective, awarding carbon credits for this switch does not contribute to additional emission reductions; the transition would have occurred without the carbon credit incentive. Conversely, in an additional case, if the company's switch to solar power is contingent upon receiving carbon credits, thus rendering the transition financially feasible, these credits would result in emission reductions that would not have otherwise transpired. Determining the true additionality of a project's emission reductions presents significant challenges. This determination requires a nuanced evaluation of the project's financial viability, the regulatory context, and other influencing factors that might drive the project's implementation irrespective of carbon credits. The principle of additionality ensures that carbon credits are awarded only for genuine, supplementary emission reductions. However, the process of identifying whether such reductions are indeed additional is inherently complex and necessitates rigorous analysis. Upholding the principle of additionality is critical for maintaining the integrity and efficacy of carbon credit markets.

Enhancing Integrity in India's Carbon Credit Markets: Addressing Monitoring and Oversight Challenges

Effective monitoring and oversight are critical components in the administration of carbon credit markets. These components ensure that emission reductions are accurately measured, reported, and verified, thereby maintaining the integrity and efficacy of the carbon credit system. In India, several challenges complicate this process, particularly due to the geographical dispersion of projects, conflicts of interest, and the reliability of third-party verification agencies.

Geographical dispersion is a significant hurdle in the effective monitoring and oversight of carbon credit projects in India. These projects are often located in remote and inaccessible areas, making it difficult for regulatory bodies to conduct frequent and thorough inspections. The vast and varied terrain of India exacerbates this challenge, as projects might span across dense forests, mountainous regions, and rural landscapes. The logistical difficulties of reaching these sites mean that regulators often have to rely on periodic and infrequent visits, which may not provide a

comprehensive picture of ongoing activities.[541] Consequently, this can lead to gaps in monitoring, allowing discrepancies and inaccuracies in emission reporting to go unnoticed. Another critical issue is the potential conflict of interest inherent in relying on information provided by project developers. Developers have a vested interest in maximizing the number of carbon credits they receive, as these credits represent financial incentives. This can lead to intentional or unintentional overstatement of emission reductions. Developers might present overly optimistic data, omit pertinent information, or employ methodologies that exaggerate their environmental impact. This conflict of interest undermines the credibility of the data reported and poses a significant risk to the integrity of the carbon credit market. Without independent verification, it becomes challenging to ascertain the authenticity and accuracy of the emission reductions claimed by developers. Third-party verification agencies are meant to address this issue by providing unbiased assessments of carbon credit projects. However, ensuring the reliability and consistency of these agencies is itself a formidable challenge. The competence and impartiality of third-party verifiers can vary widely, influenced by factors such as expertise, financial incentives, and potential affiliations with project developers. Some agencies might lack the necessary technical skills to accurately assess complex projects, while others might face pressure to deliver favorable reports to secure future business. This variability undermines the standardization and trust that are crucial for the effective functioning of carbon credit markets. Inconsistent and unreliable verification processes can lead to significant discrepancies in the issuance of carbon credits, ultimately weakening the market's environmental objectives.

To address these challenges, the implementation of Continuous Emission Monitoring Systems (CEMS) in India presents a promising solution. CEMS technology offers real-time, accurate monitoring of emissions, thereby reducing the reliance on periodic inspections and subjective reporting by project developers. By continuously collecting data on emissions, CEMS can provide a more reliable and comprehensive picture of a project's environmental impact. This data can be automatically transmitted to regulatory bodies, ensuring timely and accurate oversight. Furthermore, CEMS can help standardize the monitoring process, reducing the variability and potential biases associated with third-party verification agencies. Implementing CEMS across carbon credit projects in India would enhance transparency, accountability, and integrity within the market, addressing the core challenges of geographical dispersion, conflicts of interest, and inconsistent verification.[542]

Precisely speaking, while the challenges of monitoring and oversight in India's carbon credit market are significant, they are not insurmountable. By leveraging advanced technologies such as Continuous Emission Monitoring Systems, India can enhance the accuracy and reliability of its

[541] Cii Team. (2024b, April 12). *Indian Carbon Credit Market - CII Blog*. CII Blog. https://ciiblog.in/indian-carbon-credit-market/ last accessed 14 June 2024

[542] Cii Team. (2024, April 12). *Indian Carbon Credit Market - CII Blog*. CII Blog. https://ciiblog.in/indian-carbon-credit-market/ last accessed 14 June 2024

emission data, ensuring that carbon credits are awarded based on genuine and verifiable reductions. This would not only strengthen the credibility of the carbon credit market but also contribute more effectively to the nation's environmental goals.

Implementing Continuous Emission Monitoring Systems in India: A Comprehensive Policy Framework for Sustainable Industrial Regulation

Continuous Emission Monitoring Systems (CEMS) are essential tools for the continuous, real-time monitoring of pollutant emissions from industrial sources. These systems provide critical data necessary for ensuring compliance with environmental regulations, protecting public health, and mitigating environmental degradation. In the context of India, the implementation of CEMS is particularly vital due to the country's rapid industrialization, which has led to significant increases in air pollution levels. Effective CEMS deployment can help address these challenges by providing accurate and timely data that supports regulatory enforcement and policymaking.

To effectively implement CEMS in India and facilitate the industry's selection of appropriate instruments, ensure their long-term operation, and conduct performance evaluations, a comprehensive and consistent policy framework is essential. This policy should engage various stakeholders and address the technical, legal, and financial aspects of CEMS, including device selection, calibration, verification, data certification, data compliance, data accountability, incentives, subsidies, markets, and platforms. Currently, CEMS data is not considered admissible evidence under the Air (Prevention and Control of Pollution) Act, 1981, and therefore cannot be used for legal and compliance purposes. However, with a certified system in place, the Act could be amended to permit the use of CEMS data for these purposes.

To support the adoption of CEMS by small and medium-sized enterprises (SMEs), the government should introduce policies that provide financial incentives to offset the initial costs of installing and operating CEMS devices, such as those under the Government Credit Plan (GCP) and the Upgradation of Pollution Intensive Industries with Energy Efficient Processes (UPIIEPP). Additionally, the establishment of CEMS laboratories through public-private partnerships (PPP) can be encouraged, where both the government and the private sector share the costs and benefits of data analysis and quality assurance. Industrial development authorities could also allocate space for these labs at no cost, either through specific schemes under UPIIEPP or other incentives. These policies would help SMEs overcome financial barriers and leverage the benefits of CEMS. The research suggests establishing a consistent CEMS certification and quality assurance process in India, aligning with indigenous certification systems.[543] This requires a clear, well-defined process starting with product certification, which involves rigorous testing and verification of CEMS devices against specified standards. Certification would be contingent on the outcomes of various tests, including field, laboratory, and audit tests, to ensure that CEMS devices consistently meet quality and performance benchmarks. Until a robust domestic certification system is developed, utilizing global certification systems for monitoring purposes rather than regulation is advisable.

[543] Carbon trading in India: Local actions for the global commons Authors: Ajay Tyagi, Nilanjan Ghosh - https://www.orfonline.org/expert-speak/carbon-trading-in-india-local-actions-for-the-global-commons last accessed 14 June 2024

This approach allows for the inspection of industries based on compliance with established guidelines and enables strict actions against non-compliance. Implementing such a framework not only ensures the integrity and reliability of emission data but also fosters greater accountability and transparency within industries. This holistic approach can significantly enhance India's ability to monitor and control industrial emissions, thereby contributing to better air quality and environmental sustainability.[544]

Regulatory Framework of India's Carbon Credit Trading Scheme: Building a Comprehensive Indian Carbon Market

The Ministry of Power already has substantial experience with mechanisms like energy efficiency and renewable energy certificates, which are closely related to carbon trading. The Bureau of Energy Efficiency (BEE), an agency under this ministry, is adept at identifying industries with high potential for emission reductions. Additionally, carbon trading is intrinsically linked to energy production and consumption, allowing the Ministry of Power to integrate energy management and carbon emissions strategies effectively. Centralizing the regulation and administration of carbon credits within one ministry can streamline processes and minimize bureaucratic obstacles. The Ministry of Power, through agencies such as the Central Electricity Regulatory Commission (CERC), can also efficiently monitor and regulate trading activities to ensure market integrity.

Assessing the Suitability of the Ministry of Power for Administering India's Carbon Credit Trading Scheme

Despite these advantages, there are several critical drawbacks to placing the CCTS under the Ministry of Power. Carbon credit trading spans various sectors beyond just power, including transportation, agriculture, and waste management. The Ministry of Power may lack the expertise or jurisdiction over these areas, suggesting that a broader, multi-sectoral approach might be more effectively managed by another entity. Moreover, the Ministry of Power's primary focus on energy production could lead to conflicts of interest when regulating industries that are both sources of carbon credits and consumers of power. The proposed governance structure under the Ministry of Power is complex and multi-tiered, potentially leading to bureaucratic hurdles and inefficiencies. This complexity could also create conflicts between different organs, such as the administrator and regulator. The CERC, while responsible for regulating trading activities, might not have the necessary expertise or resources to oversee the carbon market effectively, leading to market instability and potential fraud. The Act itself does not clearly define carbon credits, creating ambiguity in their scope and potential misuse.[545]

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[544] *A ban on exporting carbon credits and its impact on the domestic carbon market - Ecosystem Marketplace*. (2022b, August 11). Ecosystem Marketplace. https://www.ecosystemmarketplace.com/articles/a-ban-on-exporting-carbon-credits-and-its-impact-on-the-domestic-carbon-market/ last accessed 14 June 2024

[545] Bhatt, N. (2024, April 4). India’s proposed carbon credit trading scheme: What it is, why it matters and what to expect. *Business Today*. https://www.businesstoday.in/opinion/columns/story/indias-proposed-carbon-credit-trading-scheme-what-it-is-why-it-matters-and-what-to-expect-424307-2024-04-04 last accessed 14 June 2024

Existing policies like the Perform Achieve and Trade (PAT) scheme and Energy Saving Certificates might overlap with the carbon trading scheme, causing confusion and inefficiencies. The Ministry of Power might also lack the capacity to manage and regulate an expanded carbon market, which could include sectors like agriculture and industrial processes. If the scheme does not effectively reduce emissions and promote sustainable practices, it could be perceived as greenwashing. Additionally, the governance structure may not ensure adequate transparency and accountability, leading to a lack of trust in the market and potential misuse of carbon credits. The involvement of multiple regulatory bodies could result in regulatory conflicts and inefficiencies, hindering the effective implementation of the carbon trading policy. Given these drawbacks, placing the CCTS under the Ministry of Environment, Forest and Climate Change (MoEFCC) could be a more suitable option. This ministry has a broader mandate covering all aspects of environmental protection and climate change, providing a more holistic approach to carbon trading that encompasses all sectors involved in emissions reductions. An inter-ministerial committee could also be effective, ensuring balanced representation of all sectors and interests, with members from the Ministry of Power, MoEFCC, Ministry of Agriculture, Ministry of Transport, and other relevant bodies.[546]

Alternatively, establishing an independent regulatory body specifically for carbon trading could avoid potential conflicts of interest and ensure focused expertise. This body could operate under the oversight of a higher government authority to ensure alignment with national goals. While the Ministry of Power has the necessary infrastructure and experience to manage the CCTS, the broader scope of carbon trading might benefit from the involvement of other sectors and ministries. A more integrated approach could be achieved through an inter-ministerial committee or by placing the CCTS under a broader ministry like the MoEFCC. Alternatively, establishing an independent regulatory body could provide the necessary focus and avoid conflicts of interest. As one speaks of the regulatory body, it is as important as any other aspect to speak of the dispute resolution mechanisms involved in the scenario.

Legal Mechanisms Safeguarding India's Interests in International Carbon Trading Agreements

India employs a variety of legal dispute resolution mechanisms to safeguard its interests in international carbon trading agreements. These mechanisms ensure that conflicts arising from such agreements are resolved in ways that protect national interests and promote fair trading practices. The primary mechanisms in place include bilateral and multilateral agreements, international arbitration, domestic legal frameworks, specialized dispute resolution bodies, and alternative dispute resolution (ADR) methods.[547] India frequently incorporates specific dispute resolution clauses in its bilateral and multilateral carbon trading agreements. These clauses typically outline procedures for arbitration, mediation, or negotiation in the event of a dispute. Additionally, as a

[546] Ravishankar, D. D. K. (2023, June 20). *India's Carbon Credit Policy and the Greenwashing Conundrum*. IRCCL. https://www.irccl.in/post/india-s-carbon-credit-policy-and-the-greenwashing-conundrum last accessed 14 June 2024

[547] *India's Evolving Carbon Credit Market*. (n.d.). Invest India. https://www.investindia.gov.in/team-india-blogs/indias-evolving-carbon-credit-market last accessed 20 June 2024

signatory to the Paris Agreement, India engages in carbon trading under a framework that encourages the peaceful resolution of disputes through negotiation and consultation among parties. For disputes that transcend national boundaries, institutional arbitration is a preferred method. The International Chamber of Commerce (ICC) provides a neutral platform and established procedures for arbitration. Similarly, the United Nations Commission on International Trade Law (UNCITRAL) arbitration rules offer comprehensive procedural guidelines to ensure fair and impartial arbitration. The Permanent Court of Arbitration (PCA) also serves as a venue for resolving international disputes, including those related to environmental and trade issues. Moreover, Bilateral Investment Treaties (BITs) signed by India often include Investor-State Dispute Settlement (ISDS) mechanisms. These provisions allow foreign investors to initiate arbitration against India if they believe their investments, including those in carbon markets, are unfairly treated.[548]

India's domestic legal framework plays a crucial role in resolving disputes related to carbon trading. The Arbitration and Conciliation Act, 1996, governs both domestic and international arbitration in India, providing a legal basis for enforcing arbitral awards and ensuring that arbitration agreements are upheld. Additionally, parties to carbon trading agreements can seek recourse in Indian courts for the enforcement of contractual obligations and the resolution of disputes. The Indian judiciary offers a robust legal framework for handling such disputes efficiently. India has established specialized bodies to handle environmental disputes. The National Green Tribunal (NGT) addresses cases related to environmental protection and the conservation of natural resources, including those arising from carbon trading. The NGT provides a specialized forum for the expeditious disposal of environmental disputes. Additionally, the Central Electricity Regulatory Commission (CERC) plays a regulatory role in the carbon market. The CERC addresses disputes related to the trading of carbon credits, ensuring regulatory compliance and market integrity. Alternative dispute resolution methods, such as mediation and conciliation, offer additional avenues for resolving disputes amicably. Various mediation centres, both national and international, provide services to resolve disputes without resorting to litigation or arbitration. The Arbitration and Conciliation Act also includes provisions for conciliation, offering an alternative method to settle disputes through mutual agreement. India has developed a comprehensive set of legal dispute resolution mechanisms to protect its interests in international carbon trading agreements. These mechanisms, ranging from international arbitration to domestic legal frameworks and specialized tribunals, ensure that disputes are resolved efficiently and fairly. By leveraging these tools, India aims to maintain the integrity of its participation in the global carbon market and foster a stable and trustworthy trading environment.

As the discussion on the viability and enforceability of the carbon credits continues to proceed with much zest, it perhaps is an interesting question to ask if these credits are interchangeable by any sense. The simplest answer is No, permits for renewable energy, energy savings, and carbon credits are not entirely interchangeable. While they all contribute to reducing greenhouse gas emissions, they have different purposes and are governed by distinct regulations. In India, permits for renewable energy, energy savings, and carbon credits serve distinct purposes under separate regulatory frameworks, highlighting their non-interchangeable nature. Renewable Energy

[548] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216 last accessed 20 June 2024

Certificates (RECs) validate renewable energy generation and permit businesses to claim the renewable aspect of projects, affecting Scope 2[549] emissions if sold. Energy Savings Certificates (ESCs) and Australian Small-scale Technology Certificates (STCs) incentivize energy efficiency but do not impact Scope 2 emissions. Carbon Credits (such as ACCUs, VCS, VERs) certify emissions reductions and affect Scope 1 emissions if sold. Each category adheres to specific regulations governed by agencies like the Ministry of New and Renewable Energy and Ministry of Environment, Forest and Climate Change. Understanding these distinctions is crucial for businesses navigating India's regulatory landscape to effectively reduce greenhouse gas emissions and comply with requisite permit requirements.

CONCLUSION

Speaking of the current scenario, The Bloomberg article quotes the Indian power and renewable energy minister, Raj Kumar Singh, stating that "*India will ban firms to export carbon credits until the nation meets its climate goals.*" India's recent policy decision to halt the export of carbon credits and instead focus on developing a domestic carbon credit market is strategically aligned with both environmental and economic objectives.[550] Environmentally, this initiative signifies India's commitment to curbing domestic emissions without reliance on international credits to meet its Nationally Determined Contribution (NDC) goals. By banning carbon credit exports, India aims to achieve a 45% reduction in emissions intensity from 2005 levels by 2030. By reducing dependence on fluctuating international markets, India can stabilize its carbon credit market and exert greater control over pricing and availability. The decision to restrict carbon credit exports may impact the global carbon market dynamics, potentially driving up prices in voluntary markets and increasing demand from other nations. However, this policy change underscores India's

[549] IPCC (Intergovernmental Panel on Climate Change). 2006. IPCC Guidelines for National Greenhouse Gas Inventories, Volume 1: General Guidance and Reporting. Prepared by the National Greenhouse Gas Inventories Programme. And Volume 2: Energy. Prepared by the National Greenhouse Gas Inventories Programme
Available online: https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html last accessed 17 June 2024

"Scope 1 - Scope 1 emissions encompass direct greenhouse gas emissions originating from sources owned or controlled by the reporting entity. These emissions stem from activities such as fuel combustion in owned or controlled equipment like boilers, furnaces, and vehicles. In the context of renewable energy and carbon credits, Scope 1 emissions also encompass reductions achieved directly by projects, such as emissions avoided through renewable energy generation or improvements in energy efficiency within an organization's facilities.

Scope 2 - Scope 2 emissions refer to greenhouse gases indirectly emitted from the generation of purchased electricity consumed by an organization. These emissions stem from activities of the organization but originate from sources not under its direct ownership or control. When a business buys renewable energy certificates (RECs), it affects its Scope 2 emissions. Conversely, if the business sells RECs generated from renewable energy projects, it must acknowledge that the purchased electricity contributes to greenhouse gas emissions.

[550] *A ban on exporting carbon credits and its impact on the domestic carbon market - Ecosystem Marketplace*. (2022, August 11). Ecosystem Marketplace. https://www.ecosystemmarketplace.com/articles/a-ban-on-exporting-carbon-credits-and-its-impact-on-the-domestic-carbon-market/ last accessed 17 June 2024

commitment to prioritizing genuine emissions reductions domestically over reliance on imported credits, thereby encouraging more substantial and sustainable reductions. Nevertheless, concerns about greenwashing—where companies exaggerate emission reductions—highlight the necessity for rigorous monitoring and reporting mechanisms to uphold the integrity and credibility of carbon credits. India's strategic pivot towards fostering a domestic carbon credit market not only supports its environmental goals by promoting local emissions reductions and renewable energy adoption but also aligns with its economic objectives by bolstering domestic demand and reducing vulnerability to international market fluctuations. While this approach presents challenges, such as potential disruption to global markets, it positions India to assert leadership in climate action and innovation while ensuring transparency and accountability in carbon credit trading. India's initiative to establish a robust domestic carbon credit market represents a significant step forward in its quest to balance economic growth with environmental stewardship. This approach offers a multitude of advantages, including fostering local investments in green technologies, reducing dependence on volatile international markets, and ensuring that emission reductions are both genuine and substantial. By prioritizing domestic carbon credits, India can better regulate and monitor its carbon market, thereby enhancing transparency and accountability. The focus on Continuous Emission Monitoring Systems (CEMS) and stringent verification processes underscores the nation's commitment to maintaining the integrity of its carbon credit system. These measures promise to drive more significant and verifiable reductions in greenhouse gas emissions, contributing to the global fight against climate change. Furthermore, by encouraging industries to adopt more sustainable practices, India not only aims to meet its climate goals but also positions itself as a leader in environmental innovation and sustainable development.

However, this transition is not without its challenges. The geographical dispersion of projects, potential conflicts of interest among stakeholders, and the reliability of third-party verifiers remain significant hurdles. Additionally, the complexities of determining additionality and ensuring the authenticity of emission reductions present ongoing obstacles. Critics argue that the focus on a domestic market could lead to isolation from the broader global carbon trading system, potentially limiting the flow of international investments and collaborations. Moreover, stringent regulations and the high costs associated with implementing advanced monitoring technologies like CEMS may place a considerable burden on small and medium-sized enterprises. Despite these challenges, India's bold step towards a self-regulated carbon credit market is a testament to its resolve to address climate change head-on. As the nation navigates the intricate pathways of environmental policy and economic growth, it stands at a pivotal juncture, poised to inspire the world with its dedication to a greener, more sustainable future. In the words of Mahatma Gandhi, "*The future depends on what we do in the present.*" India's present actions combined with the best efforts and an appropriate framework that mitigates any possible loophole would herald a promising future where economic progress and environmental responsibility, forging a path towards a harmonious and resilient world. One that is responsible and sustainable, one that does not compromise with the present or the future.

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APPENDIX

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CERTIFICATE ON PLAGIARISM CHECK

1.	Name of the Candidate	Ms. Anshika Paul
2.	Title of thesis/dissertation	Carbon Emission Trading – A Critical Analysis
3.	Name of the supervisor	Dr. Anil R. Nair
4.	Similar content (%) identified	9%
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6.	Software used	Grammarly
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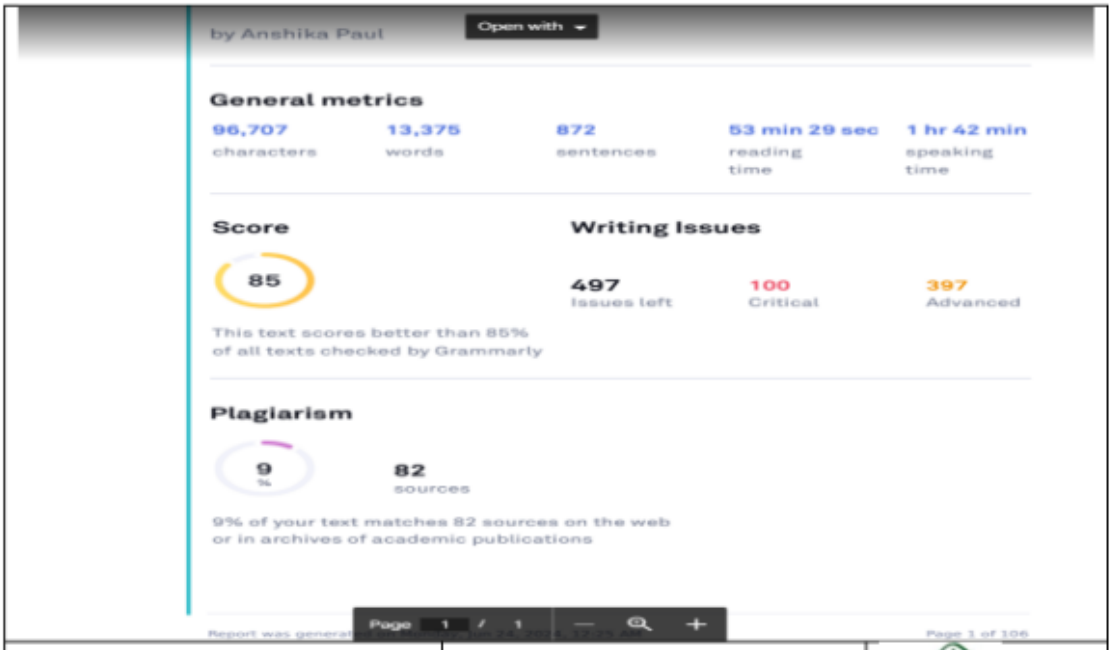

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Name and Signature of the Candidate	Ms. Anshika Paul	
Name & Signature of the Supervisor	Dr. Anil R. Nair, Associate Professor	